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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. 2.

JANUARY, 1905.

No. 1

The first number of a new volume affords an appropriate occasion for a brief review of our history during the past year. Founded at the commencement of 1903, under the patronage of the Planters' Association as a brochure supplementary to the organ of that institution, the Forester at once asserted itself as the representative of the so-called "minor" industries of Hawaii, which till then had often been disregarded and ignored. So great was the support which the new publication received that it was soon seen by its promoters that the Forester was worthy of a more dignified status, and in May it appeared as an independent journal. In successfully completing its first volume, and establishing itself among our periodical literature, the Hawaiian Forester and Agriculturist has earned not only the appreciation but also the gratitude of the agriculturists of this Territory. Prominent among its enthusiastic advocates and founders, has been Mr. W. M. Giffard to whose efforts the inception of the magazine is very largely due, and whose individuality and wide experience has set a notable standard which it will be difficult for his successors to maintain. For the future, suffice to say that it will be our endeavor to fulfil the object for which the magazine was founded, on the lines so ably marked out in the policy of the "Forester" during the past year.

Mr. Hosmer's article on the work of the United States Bureau of Forestry, contained in this number, will be widely read. It relates in a concise and interesting form the history of the forestry movement in the United States from its earliest days to the creation of the Bureau of Forestry in 1901. A short description is then given of the most important divisions of the work of the Bureau, followed by a list of the chief Forestry Schools and the necessary steps to be followed by students desirous of entering this new profession. It will probably be this latter part of the article which will attract most attention just now. The growing

interest in Forestry has already claimed the attention of many of the youths of Hawaii, and Mr. Hosmer's paper cannot be more fully supplemented than by a recent circular of the Bureau which this magazine presents in full, giving definite information and advice to prospective Forestry students.

This issue contains the first of a series of notes on agriculture and general farming by Mr. F. G. Krauss, founded on experiments conducted by him during the last few years at the Kamehameha Schools. The author's experience, not only on the mainland, but in this Territory, renders the results of his work of exceptional value. It is hoped that in the near future all the agricultural districts of the islands will be represented by contributors who will record in this magazine similar important agricultural data from their localities. The Forester cordially invites correspondence with residents in the islands who are willing to furnish important agricultural matters of current interest.

The possibilities of the development of the growing of oranges to supply the local market in place of imported fruit, renders the preparation of a work on citrus fruit cultivation, adapted to local conditions, a matter of great importance. It is to be hoped that the subject will soon engage the attention of a competent writer. By no means the least important of the problems which face an inexperienced grower of citrus fruits, is the one of soil fertilization, upon which depend not only the quantity and to some degree the quality of the fruit, but also the general health of the tree. Successful resistance of disease is by many writers attributed largely to judicious fertilization, and it is said that the prevalent "Die-back" is encouraged or even caused by the careless use of organic manure.

In spite of its splendid wealth of foliage and flowering trees, Honolulu is by no means the beautiful city a little foresight might have made it. Hitherto, building has proceeded apace and noble trees and palms have been sacrificed to the demands of expansion, so that to-day public parks are almost entirely lacking save for a few open spaces mostly confined to a small section of the town.

The time would now be opportune for citizen action to acquire control of the grounds and vacant spaces contiguous to the thoroughfares around the Capitol, Judiciary buildings and Drill

Sheds and to unite them with other available smaller spaces into one broad scheme of parks traversed by wide and well shaded driveways. The clearing up of the lot devoted to the repose of unsightly water-carts, the removal of the wall and iron fence surrounding the Judiciary Building and the dilapidated wooden structures which disfigure its grounds, and the planting of palms and shrubbery around the Drill Shed would be among the first or the improvements suggested. A noble avenue of palms and trees flanking a broad boulevard running from the new Atkinson Park beyond Kawaiahao Church to Thomas Square and a careful grouping of trees and massed shrubberies, relieved by open vistas of well-trimmed lawns and brilliant flower beds extending from the Capitol to the Drill Shed, and embracing in its scheme such outlying spaces as Emma Square and other contiguous lots which public liberality might acquire, are conjured up in the vision of what Honolulu may become when the opportunities of municipal improvement are realized.

One of the most effectual of simple devices for destroying nocturnal flying insects may be described as follows: A short stake is driven upright in the ground and on this a shallow pan is fixed. Upon a block of wood occupying the centre of the pan, a lighted lamp, protected by a glass chimney is set, and a quantity of thick sticky fluid poured into the pan around the block. This device offers a lure to moths and other insects, which fly against the glass and drop into the liquid below. When it is remembered that the army-worm and the larvæ of many other destructive insects are hatched from the eggs of flying insects it will be seen that the value of these traps is considerable. In many cases the exposure of one or two of these insect traps near flower and vegetable beds, during the nights injurious moths are numerous, would greatly increase the possibilities of a successful crop.

Perfumery farming has in the past afforded a substantial livelihood to small communities in countries whose thrifty people have displayed a particular aptitude for such delicate work. It has been suggested that the industry could be built up in these islands among the Portuguese and others who possess small plots of land at their disposal. The discovery of the synthetic manufacture of perfumery has, however, rendered the manufac-

ture of perfume very precarious, and in some cases the large French growers have relinquished their former methods of production, and have established chemical perfumery works to compete with the American and German artificial products. It seems therefore unlikely that the cultivation of perfumery flowers in Hawaii would be profitable, and although we may not witness the entire disappearance of this beautiful industry, it seems unlikely that it will ever be extended. The presence of an abundant supply of wild mimosa in the islands, which furnishes one of the most expensive natural perfumes, may perhaps, render the collection of the flowers of this plant and the manufacture of cassie perfumery profitable. The possibilities of the profitable production of the essences of such tropical flowers as the Ihläng-ihläng, seem also worthy of attention and we hope to again revert to this subject in a subsequent number.

The marketing of a quantity of koa lumber will prove a noteworthy event in the history of our exports. It is to be regretted that so little is known on the mainland of the commercial woods of these islands. A complete collection of Hawaiian economic woods, is greatly to be desired. In many cases the beauty of their texture is only equalled by their possibilities of utility. Not only are hard woods of beautiful grain, capable of retaining a splendid polish, well represented in Hawaii, but also others whose peculiar properties would make them valuable for special purposes. Notable among the latter is the wood of the wai-wai tree, whose extreme lightness will no doubt some day find an economic application.

The importance of an uncontaminated water supply need not be enlarged upon, but in view of the re-iterated advocacy of distilled water for drinking purposes, a word of warning may be timely. If water could be distilled in vessels of entirely insoluble composition its use as a beverage could not even than be recommended, as in its absolutely pure state, water would not only deplete the system of necessary salts, but also do harm by penetration of the muscular tissue. Pure water, however, possesses wonderful capacity as a solvent agent and "distilled water" always contains certain metallic or other poisons derived from the vessel in which it has been prepared. Water distilled in copper or tin vessels is contaminated with salts of these poisonous metals, and

even glass lined stills yield water containing traces of lead or other deleterious impurities. Although the quantity of toxic matter contained in "distilled water" is infinitesimal, the injury derived from its habitual use cannot be denied or ignored. Delicate aquatic organisms placed in this fluid soon die in consequence of the presence of these poisons, even when the water has been sufficiently aerated. Distillation removes disease germs it is true, but ordinary boiling and filtration do this no less effectively and produce a liquid in every way suited as an ordinary beverage.

In the December number of this magazine (Vol. I, pp. 352-355) there appeared, with a notice of the public hearing, reports in regard to the setting apart as a forest reserve of certain forest lands in the north end of the Hamakua District of the Island of Hawaii.

The hearing having been duly held and no opposition to the reserve having developed, Gov. Carter, on December 23, proclaimed the section a forest reserve.

Gov. Carter's proclamation appears in this issue.

Through pressure of work Mr. Terry has been unable to continue in this number his valuable series of articles on the Economic Insects of Hawaii. We hope to be able to present the next of Mr. Terry's article next month.

Mr. D. L. Van Dine has very kindly taken in hand for the Forester a paper relative to the insect pests in this Territory affecting the experiments now being conducted in the cultivation of tobacco.

THE WORK OF THE UNITED STATES BUREAU OF FORESTRY.

[A paper delivered before the Farmers' Institute of the Territory of Hawaii, on April 23, 1904, by Ralph S. Hosmer, Supt. of Forestry.]

The interest in forestry which has developed in the United States within the last half dozen years is a matter of surprise to many persons. To those who have not followed the movement it is hard to understand the rapid rise of forestry as a profession

and the wide field of work which is now open to the men trained in it. But the phenomenal development of the last six years is the result of long and patient work in the past, in which the part played by the men of the United States Agricultural Department has been a large one. As an account of what the Bureau of Forestry has done is in the nature of a history of forestry in the United States, it may not, perhaps, be out of place to review briefly the more important points of the story.

Although there had been discussion of the subject before, the first really definite step in forestry in the United States was the appointment, about thirty years ago, of a special agent in the Federal Agricultural Department, whose duty it was to report on the forest conditions of the country. In consequence of this appointment four reports were issued between 1877 and 1884 by Messrs. F. B. Hough and N. H. Egleston. In 1884 the latter gentleman was regularly appointed Chief of the Division of Forestry. He was succeeded in 1886 by Dr. Bernhard E. Fernow, who remained at the head of the Forestry Division until 1898.

Much valuable information was got together and compiled during the earlier years, but it was not until Dr. Fernow took charge that the Division was really put upon its feet. Dr. Fernow, who is a German by birth, was educated in the Forest Schools of Germany and was the first man in this country actually to practice forestry as a profession. While at the head of the Division of Forestry, Dr. Fernow never had large appropriations, so that his work was confined for the most part to gathering statistical information and to educating the people of the nation as to what forestry really means. Being a fluent and interesting speaker, Dr. Fernow was often called upon to address various assemblies on forestry, and in this way, together with his writings on the subject, he, more than any other individual or group of men, laid the foundation of much of the public sentiment which exists to-day. The work of Dr. Fernow thus made possible the rapid development which has gone on in later years. In July, 1898, Dr. Fernow was succeeded as chief of the Division of Forestry by Mr. Gifford Pinchot, who is now at the head of the Forest Service in the United States.

Mr. Pinchot is a young man of wealth and position, whose deep interest in forestry has caused him to throw himself, heart and soul, into the work. After Mr. Pinchot's graduation from

Yale he went abroad and studied in the Forest Schools of Germany and France. Returning to this country he was made Forester of Mr. George W. Vanderbilt's estate, Biltmore, in North Carolina. Having established this forest on a business basis, Mr. Pinchot opened an office in New York City as Consulting Forester, when he undertook the management of several large forest tracts in the Adirondack region of New York State and elsewhere. Since July, 1898, he has been Forester of the United States Department of Agriculture, which has made him one of the most important and busiest men on the scientific staff of the Government.

Mr. Pinchot comes very near to realizing the ideal of what the head of one of the Government's important lines of work ought to be. A man of the highest character, thoroughly versed in the details of his profession, an admirable administrative officer, who so inspires his subordinates with his own high ideals, that they feel it a privilege to work with him, Mr. Pinchot is justly regarded as one of the foremost men in the Government service.

On July 1, 1901, the Division of Forestry was raised to the rank of a Bureau, giving it additional power and enabling it to expand more easily than when in the more restricted divisional form.

Before 1898 the main activity of the Division of Forestry was, as has been said, the gathering of information and the dissemination of knowledge in regard to forestry. With Mr. Pinchot's coming, work of a different character was undertaken. Soon after his appointment a circular was issued, offering the advice and assistance of the Division to owners of timber lands in the management of their forests. Advantage was taken of this offer by many persons, with the result that the Division was soon overtaxed to answer the demand. Working plans showing how the forest should be managed to secure the best results in the long run, were prepared for a number of large tracts in different parts of the country, as well as for a host of small wood lots belonging to farmers and other individuals. This phase of the work has been continued, notwithstanding the increasing demands on the Bureau in other directions, and forms the corner-stone of its present policy.

A few years ago it was the popular opinion, that a forester was a visionary sort of person, quite harmless, whose one and

great desire was to prevent a "single noble tree" from being felled. To this, he was thought to add some knowledge of the pruning of street trees and the planting of ornamental shrubs.

This point of view has now, for the most part, past away for it has been demonstrated that forestry is sound, common sense, business policy applied to the management of forest land by technically trained men. President Roosevelt summed up in a word what forestry really is when he said, "Forestry is the preservation of forests by wise use." It is not at all the part of the forester to prevent forests from being cut down when the proper time comes. What he wishes, rather, is to see them so cut that another crop may be assured and that the lumbermen may come back in the future to get additional harvests.

That this can be done has been proved on the tracts managed by the Bureau of Forestry to the satisfaction of the leading lumbermen of the country. And the men of the forestry profession are now looked upon by the lumbermen as their best friends. This is as it should be for the two must work in harmony—the one by his knowledge of how the forest grows providing for repeated crops, which the other can put up on the market and make available for use.

FOREST MANAGEMENT.

The co-operative study of forest conditions and the making of working plans began with the private owner. Later, at the request of the Secretary of the Interior, who, at present, controls the administration of the public lands set aside as National Forest Reserves, the preparation of working plans for this great area of over 60 million acres was begun, a task which will require a number of years to complete.

Applications are still received from the private owner, both for large forest tracts and for wood lots, and working plans are prepared for both as fast as the men and money available will allow.

This work falls to the Division of Forest Management of the Bureau, which has two sections, Public Lands and Private Lands, each with a corp of trained men.

But forestry is not alone the production of repeated crops of trees. It is a many-sided profession and touches various industries at numerous points. Although most important as a source of timber, the forest is valuable for other reasons. Often a forest

cover is needed on the slopes of important watersheds to protect and safeguard the supply and to equalize the run-off. In such "protection forests" it is often advisable that the forest be kept intact and that no cutting at all be done. Again the forest may be valuable for certain products obtained from the trees—as for example in the turpentine industry of the Southern States. Sometimes the beauty of the forests is its best asset, as the growing interest in forest æsthetics proves.

FOREST EXTENSION.

Perhaps the most important phase of the subject next to the proper management of the great area of existing forest is the planting of forests in treeless places. As forest extension now forms one of the main lines of work of the Bureau I wish to speak of it in some detail.

Soon after the circular offering advice as to the management of forest lands, there came another, similar offer to persons who desired to plant areas of forest. This work was first undertaken for the treeless plains of the middle west but was later broadened to include the entire country. With the creation of the Bureau, the Section of Tree Planting became the Division of Forest Extension. It is under the able direction of Mr. William L. Hall, who last year (1903) was sent by Mr. Pinchot to investigate the forest conditions of these islands, and whose full report appeared in the last number of the "Hawaiian Forester and Agriculturist," (April, 1904.)

The Division of Forest Extension carries on its work through five sections, which are named as follows: Co-operative Planting, Reserve Planting, Forest Replacement, Forest Fires, and Reclamation of Shifting Sands.

The titles are explanatory of the work of the sections, except perhaps Forest Replacement, which deals with the extension of the forest, by natural means, over lands on the edge of forest belts, and with the investigation of methods by which natural reproduction may be assisted.

FOREST INVESTIGATION.

The Bureau of Forestry has four other Divisions besides those already described.

The Division of Forest Investigation deals more directly with

the purely scientific side of forestry, although like all of the Bureau's work, its aim is first, foremost, and all the time distinctly practical. It studies the habits and characteristics of the various forest trees of the United States, their distribution and use, together with general dendrology—the botanical study of trees. Other lines of work are investigations into the improvement of special industries through better methods, like the new system of turpentine orcharding already mentioned, the application of various woods in untried ways, such as the wider use of veneer and the introduction into the market of valuable but little known species. Further investigations are carried on by this Division in Forest Entomology and in Dendro-Chemistry—a study of the value of different woods for tannins, gums, and resins.

In charge of this Division is Mr. George B. Sudworth, who ranks next to Prof. Charles S. Sargent as the leading dendrologist of the United States.

FOREST PRODUCTS.

The Division of Forest Products covers a field of great economic importance. Its main lines are the investigation of the strength of timbers and of wood preservation, the latter particularly in reference to railroad ties. The results obtained by this Division are creating widespread interest among architects and engineers, for very little scientific work has heretofore been done on either of these subjects.

FOREST MEASUREMENTS.

A large part of the field work of the Bureau consists in the collection of facts and figures relating to the stand of the commercially important trees, the yield per acre and their rate of growth. On the results of computations of these data rest the recommendations contained in the working plans. The Division of Forest Measurements has charge of the computation of these figures, together with the devising and improvement of methods for use in the field.

Mr. Overton W. Price, the Associate Forester in charge of this Division, also acts as Mr. Pinchot's representative during the absence of the latter from Washington. As Mr. Pinchot is often called away this throws much responsibility on Mr. Price.

RECORDS.

The increase of the Bureau in size and efficiency necessitates a large clerical force to handle the information collected in the field and to prepare it for publication. To this is added the care of the growing collections of photographs, the library and field equipment. Much of this work is now organized under the Division of Records which simplifies the administration of the Bureau and takes the office routine from the shoulders of the busy specialists.

OFFICE OF THE FORESTER.

The remaining lines of work carried on by the Bureau are under the immediate supervision of the Forester and are classified as belonging to his office. One of these is the examination of portions of the public domain which it is recommended be set aside as additional forest reserves. Other investigations are from time to time added as larger appropriations or more men are available.

APPROPRIATIONS.

The growth of the Bureau can, perhaps, be shown in no better way than by a comparison of the amounts appropriated by Congress for the work of the Bureau, during the last few years. They are as follows:

For the fiscal year ending June 30, 1898.....	\$ 28,520
For the fiscal year ending June 30, 1899.....	28,520
For the fiscal year ending June 30, 1900.....	48,520
For the fiscal year ending June 30, 1901.....	88,520
For the fiscal year ending June 30, 1902.....	184,630
For the fiscal year ending June 30, 1903.....	292,350
For the fiscal year ending June 30, 1904.....	350,000

For the next fiscal year, beginning July 1, I understand that something over \$450,000 will be available.

Previous to July 1, 1901, as a Division, \$8,250 of the above amounts went annually to pay the salaries provided for on the statutory roll. Since that date, with the Bureau organization, the statutory salaries have amounted to \$38,350.

Rapid as has been the expansion since 1898 it has not kept pace with the demands made on the Bureau for forest work in the different branches enumerated in the summary given above.

There is an ever increasing pressure which can only be met as more men and larger appropriations become available.

FOREST SCHOOLS.

In this connection it may be interesting to devote a moment to the sources from which the Bureau gets its recruits, for while there is no official connection between any of the forest schools and the Bureau, the relation is necessarily intimate, as the majority of the students enter government employ soon after graduation.

There are at present four regular forest schools in the United States. Courses in forestry are also given at a number of the colleges throughout the country.

The four schools are the Yale Forest School, a department of Yale University; the Biltmore Forest School, at Biltmore, North Carolina; the Forestry Department of the Lawrence Scientific School of Harvard University; and the Forestry Department of Michigan University.

The Yale School is a graduate school, open only to holders of Bachelor's degrees. It gives the degree "Master of Forestry," after a two years' course.

Harvard and Michigan each has a four years' course leading to the degree, "Bachelor of Science in Forestry."

The Biltmore course is one year—no degree is given. This school has the advantage of being located on the 120,000 acre tract of Mr. Vanderbilt, where the students have an opportunity of engaging in actual forestry work as a part of their course.

FOREST STUDENTS.

The field parties of the Bureau are made up largely of Forest Students, under the direction of Forest Assistants, as the men are called who have passed the strict technical examination and been appointed under the civil service. The Forest Students are for the most part young men from the forest schools who put in their vacations in doing practical work in forestry in the field. They are paid \$25 a month and their expenses while in the field. The traveling expenses of the second year Forest Students are paid by the Bureau. The first year men pay their own way to and from the field.

The plan is a good one in that it works both ways. The Bureau has the advantages of getting at a low wage the services of intelli-

gent men, who becoming accustomed to the work, can be advanced to higher grades. The Forest Students themselves can see just what forestry in the field really is, can get in valuable training and can round out their theoretical knowledge by practical experience in the woods. The result is that after a couple of field seasons the young forester is ready on graduation for his civil service examination, when he takes his place among the junior Forest Assistants.

FORESTRY ORGANIZATIONS.

An account of the Bureau of Forestry would not be quite complete without reference to the two forestry organizations which although having no official connection with the Bureau, are in even closer touch with it than are the forestry schools.

The American Forestry Association is made up of members in every state and territory who by the payment of an annual fee of \$2 each, support the association in its work. Through its magazine "Forestry and Irrigation" the members of the Association are kept informed of the progress of forestry and with what is being accomplished by the men of the profession. There are a number of members of the American Forestry Association in this Territory. There should be more.

The other organization is the Society of American Foresters. In this Society the active membership is limited to professional foresters of achievement; the associate membership to "those gentlemen who have rendered notable service to the cause of forestry in America." The Society is to the profession of forestry what the American Society of Civil Engineers is to the men of that profession. It brings the professional foresters of the country together and helps materially to increase the strong *esprit de corps* already existing among them.

CONSOLIDATION OF FOREST WORK.

Beside the Bureau of Forestry of the Agricultural Department, two other branches of the Government are at present doing forestry work. The administration of the forest reserves, as of the other public lands, now rests in the General Land Office of the Interior Department. As has been said before the Bureau of Forestry is preparing working plans for the various forest re-

serves, showing how they ought to be managed, but when it comes to carrying these plans into effect, the technically trained men of the Bureau have to stand aside—acting only in an advisory capacity.

The other forestry work done outside of the Bureau, is the forest mapping carried on by the United States Geological Survey, which is also in the Interior Department. While there is, in this case, no particular conflict, there is unnecessary duplication of routine detail, incident to the work being done by one department for another.

A bill is now before Congress bringing together under the direction of the Forester of the Agricultural Department all the forestry work of the Government, leaving to the Land Office the adjustment of title and the other similar functions properly belonging to it. It is expected that this bill will soon become law, a consummation devoutly to be hoped for, as the present condition is, to say the least, anomalous.

With the transfer of the management of the Reserves to the Bureau will come additional work and responsibility.

President Roosevelt has said "The forest problem is in many ways the most vital internal problem in the United States. The more closely this statement is examined the more evident its truth becomes. In the arid region of the West agriculture depends first of all upon the available water supply. In such a region forest protection alone can maintain the stream flow necessary for irrigation, and can prevent the great and destructive floods so ruinous to communities further down the same streams that head in the arid regions."

The relation between forestry and irrigation is indeed so intimate that, in arid regions each forms a part of the other. This is well appreciated both by Mr. Pinchot and Mr. Newell, the Director of the Reclamation Service.

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SUGGESTIONS TO PROSPECTIVE FOREST STUDENTS.

[Circular No. 23 (second revision), U. S. Department of Agriculture, Bureau of Forestry.]

INTRODUCTION.

The Bureau of Forestry receives a large and increasing number of requests for information upon matters treated in this circular. The purpose of its publication is to supply this information fully and promptly. Inquiries from those who think of taking up forestry, which are not covered by this circular, will always be answered willingly. It will be understood, however, that, although the Bureau of Forestry stands ready, so far as it can, to assist and advise the forest students, it can reasonably go no further than to explain the situation and point out the means by which a man may prepare himself for it. It can no more assume the responsibility of deciding for the prospective forest student whether he will do well to take up forestry than it can predict to what position he will attain as a forester.

POSITION OF FOREST STUDENT.

The only position in this Bureau open to those whose training in forestry is incomplete is that of Forest Student. It has been created in order to afford young men who have determined to make forestry their profession, an opportunity to become familiar with the methods of this Bureau in the field and in the office. It must be clearly understood that work as a Forest Student does not constitute in itself a stepping-stone to higher positions in the Bureau of Forestry, but forms a part only of the training useful in fitting a man for the profession of forestry. It is the policy of the Bureau to retain a man as Forest Student only long enough for him to gain full advantage from the opportunities for field and office work which the position affords. He will then be expected to continue his training elsewhere.

Forest Students are, as a rule, appointed for the field season only. This varies from three to six months or more, according to the locality and the demands of the work. A limited number are retained after the field season closes, in order to assist in the office of the Bureau in working up data obtained in the field. The

eligibility of a Forest Student to be continued in the office during the winter depends upon the quality of his field work and upon the seriousness of his intention to take up forestry.

Forest Students, while in the field, receive \$25 per month, with the payment of their expenses for living and for local travel. They are required to defray their traveling expenses to the field from their homes. If they take up work in the office at the close of the field season, the cost of the journey from the field to Washington is borne by the Bureau. Those Forest Students with field experience whose services are desired in the office during the winter are assigned to duty as assistant Forest Experts, and are paid at the rate of not more than \$500 per annum while working in Washington.

An application blank for the position of Forest Student is furnished on request by the Forester, U. S. Department of Agriculture. This blank, when filled in and returned by the applicant, is filed for consideration when the appointment of Forest Students for the field season is taken up. The fitness of the applicant for appointment is judged from his answers to the questions upon the blank. The two main conditions upon which his appointment depends are that he has definitely decided to make forestry his profession, and that in age, physical condition, and general training he is well equipped for the duties of Forest Student, and is fitted to profit by his work. No applicant under 20 years of age is eligible for appointment as Forest Student. Men, therefore, who are already advanced in the study of forestry, either at a forest school or elsewhere, and who are in other respects well qualified, stand the best chance of appointment. In the same way, college graduates take precedence of undergraduates, and undergraduates of those who have had school training only. Men entirely without college training are appointed to the position of Forest Student only when they are exceptionally well fitted for the position. In the selection of applicants from students of colleges and universities, the number of appointments usually exceeded the number of applicants, and it is probable that the excess was due to the fact that the number of applicants was small, and that the number of appointments was large. The men appointed to the position of Forest Student are usually well qualified for the technical work of the forest.

field work required of Forest Students is severe, monotonous, and often entails some hardship. Forest Students in the field usually live in camp and are required to keep lumbermen's camps. Their work consists chiefly in "valuation surveys," or measurements of the standing timber upon given areas, and in "analyses," or measurements of contents and rate of growth upon felled trees.

Perfect obedience to orders is required of all Forest Students. Disobedience or discontent is fatal to camp discipline and to effective work.

No Forest Student is retained who proves physically unfit for the duties or who shows a desire to shirk them. Bodily strength and endurance are absolutely essential for those who perform the work of a Forest Student. Work in the woods differs widely from camp life as it is usually understood. A Forest Student must be prepared to combine severe mental work with arduous bodily labor under conditions which make each one peculiarly trying.

Those appointed to the position of Forest Student in this Bureau must realize fully in the beginning that they will receive no formal instruction in forestry. They are not attending a summer school, but are taking a salaried position, the duties of which they will be rigidly required to perform. Forest Students in the field are placed under the supervision of trained foresters in the performance of technical forest work. The head of the party is at all times willing, in so far as it does not interfere with his own work, to explain matters to the men under his charge and to suggest further lines of individual study. He has, however, no authority to deliver lectures nor to give formal instruction of any kind. Each Forest Student has in his daily work abundant opportunity for learning; whether he makes the most of it rests with him.

POSITION OF FOREST ASSISTANT.

The position in this Bureau open to trained foresters is that of Forest Assistant. It carries a salary of from \$720 to \$1,000 in the beginning, with the payment of all living and travel-expenses incident to field work. Forest Assistants generally spend about six months of the year in the field; the other six months are spent in the preparation of reports in Washington. The position entails a severe technical examination under the Civil Service Commission, which no man may reasonably expect to pass unless he has been thoroughly trained in forestry.

PREPARATION FOR FORESTRY.

The preparation for forestry as a profession may best begin with a college or university course, in which the student should acquire some knowledge of the auxiliary subjects necessary in forestry. Of these, the more important are geology, physical geography, mineralogy, chemistry, botany, in particular that branch which deals with the anatomy, physiology, and life history of plants, and pure and applied mathematics, including a practical understanding of the principles of surveying. The student who, in his college course, can include physics, meteorology, and political economy will be the better equipped to take up his technical forest studies.

Graduation at a college or university should be followed by a full course at a school of instruction in professional forestry, of which there are now several in this country.

Vacations, during the course of training, should be spent in the woods so far as possible. The student should take advantage of every opportunity to study forest conditions and to acquaint himself with technical forest methods in field work. He should also see all he can of lumbering, which, on its executive side, is closer to forestry than to any other calling. A good knowledge of the lumberman's methods is an essential part of a forester's education.

Whenever possible the Forest Student should supplement his systematic studies in this country by six months to a year spent in studying the effects of forestry upon the forest in Europe. Although European forest methods can seldom be adopted without modification in this country, they have been rich in suggestion to the application of practical forestry to American forests. The American forest student who puts aside a chance to see forestry in Europe, runs the same mistake that a medical student would make in neglecting to have the opportunity to practice in the best

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fast lines, although study at a forest school has become essential. A great deal must depend upon a man's zeal and industry, and upon his natural fitness for forest work. On the other hand, the man who is considering forestry as a profession will do well to remember that the only sound basis for success in forestry, as in any other scientific profession, is a thorough and systematic preparation; that no matter how high his natural abilities may be, the insufficiently trained forester can not hope to compete with those who have enjoyed full advantages in their preparation; and that in this country, perhaps more than in any other, forest problems present difficulties which require, above all, a thorough understanding of his work in the man who undertakes to deal with them.

THE OPENING FOR FORESTERS.

The management of the National forest reserves will require the services of many trained men. The Bureau of Forestry will require an increasing number of suitably prepared foresters to supply its needs. The lack of foresters to care for the forest interests of several States is already making itself strongly felt. An increasing number of foresters will be required by private forest owners, as the great holders of timber lands come to realize more generally that conservative lumbering pays better than the methods now employed. The Forestry Bureau in the Philippines offers what is in some ways an unrivaled opportunity to trained men.

As regards compensation, forestry offers the well-prepared man a fair living. It is naturally impossible to foretell what will be the pay of foresters in this country. It is reasonably certain, however, that their salaries will never be large. Trained foresters in the employ of the Bureau of Forestry now receive from \$900 to \$3,500 a year.

GIFFORD PINCHOT,
Forester.

Approved:
JAMES WILSON,
Secretary of Agriculture.
Washington, D. C., July 1, 1904.

THE VEGETABLE GARDEN.

BY F. G. KRAUSS.

NOTES FOR JANUARY.

To secure the maximum pleasure and profit from the garden, it is essential that the most suitable location in regard to soil, exposure and accessibility be selected, though the skilful gardener may succeed even when these are unfavorable, but for the amateur without previous experience every natural aid will be of great advantage.

At this season of the year when heavy rains prevail, a porous, well drained soil is desirable, but if not available, narrow raised beds, well composted with coarse barn-yard manure are productive of good results, and if favored with a warm sunny exposure, will insure early maturity of crops.

For the home garden, say, for a family of five, a patch 100 x 150 feet (about one-third of an acre) should be sufficient for a continuous succession of crops. Planting in long rows, permits the use of wheeled hand implements such as the Planet Jr. line, thereby economizing labor. However, some of the smaller vegetables, such as radish, early onions etc., do best when planted closely in beds. Perennials, such as Artichokes, Asparagus, Rhubarb, and some of the kitchen herbs, should be given a permanent location upon first establishing the garden. If sweet potatoes are to be grown they may adjoin the permanent beds, as they require a long season to mature. Vine crops, such as cucumbers, squash or melons may follow; then corn, root-crops, cabbages, etc., all of which allow of wheel-tool tillage. The balance of the land may be laid out into beds for the more delicate crops, permitting of more careful tillage and at the same time economizing space.

For fertilizers, a well rotted stable manure is best for general purposes as it improves the texture of most soils, as well as adding the desirable food elements. Wood ashes is also good, supplying the mineral part of the plant food. Chemical commercial fertilizers must often be resorted to, and give good results in experienced hands. Nitrogen in the form of nitrate of soda, and phosphates in the form of Thomas Slag (a phosphate of lime) giving notable results in our experience, but, lastly, it should be

remembered that other things being equal, "tillage is more than half the manure."

With the land well tilled, heavily fertilized and carefully drained, the next requisite is good seed of suitable varieties, the importance of which cannot be overestimated. Poor, cheap seed and unsuited varieties are the cause of many failures.

Some experimenting and testing of varieties will be necessary, but too great diversification should not be attempted by the beginner. Seedmen's novelties rarely come up to expectations, and it is better to hold to standard well established sorts when once found.

The following varieties of vegetables have been successfully grown by the agricultural department of Kamehameha Schools, at Kalihi, Oahu, during the past four years, and are selected from some three hundred and fifty varieties tested in our trial-grounds during 1901-1902:

GARDEN VEGETABLES SUITABLE FOR HAWAII.

The figures represent approximate number of days required from sowing to attain an edible stage. Range depending on season and variety. For descriptions see seed catalogues.

Artichoke, Large Green Globe.

Asparagus, Conover's Collosa and Palmetto.

Beans, Pole—55 to 90 days—White Creaseback, Old Homestead, Horticultural or Cranberry, Southern Prolific, Horticultural Pole Lima, Yard Long, or Asparagus Beans.

As a rule, it requires from one to three weeks longer for pole beans than corresponding varieties of dwarf beans to mature.

Beans, Pole Lima—60 to 100 days—Early Jersey Lima, Siebert's Large Early Lima, Large White and King of the Garden.

Limas are slower to mature than "snap" beans.

Beans, Bush Lima—50 to 80 days—Henderson's Imp. Bush Lima, Burpee's Quarter Century, Kumerle or Dreer's Bush Lima.

Beans, Bush, Green podded—45 to 65 days—Burpee's Stringless Green-podded, Early Mohawk, Red Valentine Imp. Er. Rd. pod., Early Long Yellow Six Weeks, Refugee or Thousand to One.

Beans, Shell—75 to 100 days—Goddard or Boston Favorite, Red Kidney, White Marrow-fat and Crystal Wax.

Main crop ready to harvest as a shell bean 75 to 100 days from planting; during wet seasons it may require 120 days.

Beans, Bush, Yellow Wax podded—45 to 70 days—Improved Golden Wax, Crystal White Wax, Burpee's Saddleback Wax, Early Prolific Dwarf German Black and Refugee Wax.

A selected Kam. strain of Imp. Golden Wax is ready for the table in 55 days from sowing.

Beets—40 days—Swiss Chard or Sea Kale Beet.

Beets—45 to 90 days—Extra Early Bassans, Eclipse, Crosby's Egyptian and Broccoli, Large White.

Brussels Sprouts—120 days—Perfection and Paris Market.

Cabbage—100 to 175 days—Burpee's New Early Baseball, Early Jersey Wakefield, Early Winnigstadt, Surehead, Early Stonehead, Vondergow, Am. Drumhead Savoy and Perfection Drumhead.

Carrots—50 to 80 days—Donver's Half-long Orange, Short Horn or Er. Scarlet Horn, Chanteney or Model, Oxheart or Guerande and Early French Forcing.

Cauliflower—100 to 125—Burpee's New Dry Weather, California Wonder and Extra Early Snowball.

Celery—150 days—Golden Self-blanching and White Plume.

Celeriac (Turnip Rooted.)—150 to 200 days—Large Smooth Progue.

Chicory—120 days—Large Rooted.

Collards—75 days—No. Carolina Blue Stem.

Corn, Sweet—70 to 90 days—Early Mammoth Sugar, Stowell's Evergreen, Extra Early Cosmopolitan and Burpee's Golden Bantam.

Corn, Popping—100 days—Queen's Golden and Rice.

Cucumber—75 to 105 days—Long Green, Burpee's Ford Hook Famous, Coy's Cumberland, Giant Pera and Cox's Improved White Spine.

Egg Plant—90 to 120 days—New York Improved Large Purple, Burpee's The Pearl and Burpee's Black Beauty.

Endive—65 to 75 days—Green Curled.

Horse Radish—1 year—Large Rooted Variety.

Kale—50 to 80 days—Dwarf Green Curled Scotch.

Leeks—100 to 120 days—Broad London Flag and Carentan.

Lettuce—45 to 75 days—Deacon (S. F. Market), The Morse, California Cream Butter and Cox's Improved Hanson.

Muskmelon—100 to 140 days—Burpee's Netted Gem, Rocky Ford and Calif. Large Nutmeg.

Watermelon—100 to 175 days—Kolb's Gem, Mammoth Iron Clad, Cuban Queen, Lodi and Ford Hook Early.

Garden Mustard—40 to 75 days—Ford Hook Fancy and Southern Giant Curled.

Okra or Gumbo—80 to 120 days—N. J. Perfected Perkins' Long Pod and Long Green.

Onions—Australian Brown, Prize Taker, Yellow Danvers (globe), Red Wetherfield, White Portugal or Silver Skin and White Multiplier.

Young green onions from seed ready for table in 60 to 90 days. Dry mature onions for storage 120 to 180 days.

Parsley—100 to 150 days—Extra Curled Dwarf or Emerald and Dark Moss Curled.

Parsnips—150 days—Improved Guernsey, Long Smooth or Hollow Crown.

Peas—60 to 80 days—Nott's Excelsior, Yorkshire Hero, Telephone, Gradus or Prosperity.

Dwarf varieties mature much more rapidly than the tall growing varieties.

Peppers—Chinese Giant (sweet), Ruby King (sweet), Long Red Cayenne, True Red Chili and Golden Dawn.

Radish—25 to 50 days—Cox's Rose Queen, Improved Chartier, Scarlet Olive Shaped, Early Round Deep Scarlet and Round Black Spanish.

Rhubarb, Burbank's New Crimson Winter and Victoria.

1 yr. old imported roots bear marketable stems in from 60 to 80 days.

Salsify—150 days—Mammoth Sandwich Island.

Spinach—80 to 100 days—Victoria and New Zealand (*Tetragonia expansa*).

Squash (Summer varieties)—75 to 100 days—Burpee's Bush Ford Hook, Early White Bush, Scalloped, New Mammoth White Bush and Vegetable Marrow.

Squash (Winter varieties)—100 to 140 days—Ford Hook Bush and Boston Marrow.

Squash (Hubbard varieties)—120 to 160 days—Old Green

Hubbard (common), Chicago Warty Hubbard, New Red or Golden Hubbard, Mammoth Whale, Heart O'Gold, New Mammoth Chili and Golden Marrow.

Large winter sorts require 20 to 40 days longer to mature than the small sorts.

Tomatoes—130 to 190 days—Burpee's Quarter Century, Ponderosa, New Stone, Acme and Honor Bright.

Tomatoes (ornamental varieties)—120 to 150 days—Red pear-shaped, Yellow pear-shaped, Red Cherry and Yellow Cherry.

Turnips—65 to 90 days—Early Flat Red and White Dutch.

Rutabaga—150 to 200 days—Imp. Purple Red Top.

Herbs, Sweet Medicinal and Pot—150 days to 1 year—Sage, Dill, Rue, Wormwood, Anise, Basil (sweet), Rosemary, Borage, Caraway, Fennel (sweet) and Thyme.

Grown with varying success. Only the first four thrive with us.

RARE PLANTS WORTHY OF TRIAL.

Roselle (Hibiscus Sabdariffa)—Over 1 year.

Martynia Proboidea—150 days.

The above lists are arranged according to adaptability, productiveness, and quality under our conditions, from critical notes covering several average seasons, the best variety all things considered coming first.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE.

Under and by virtue of the authority vested in me by the provisions of Act 44 of the Session Laws of the Territory of Hawaii, enacted April 25, 1903, and of every other power me hereunto enabling, I, George R. Carter, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said act provided, do hereby set apart as a forest reserve the Government lands lying between the Waipio Valley and the District of Kohala, in the north end of the District of Hamakua, Island of Hawaii, described as follows, viz.:

Beginning at the mouth of Honokea Gulch by the sea, being the boundary of the lands of Awini and Honokea, in the Districts of Kohala and Hamakua respectively, running thence up the center of Honokea Gulch and along Awini Homesteads to the land of Honokane; thence along said land of Honokane in a southerly direction to its junction with the lands of Kawaihae First and Puukapu; thence in an easterly direction along the land of Puukapu and the north side of Kawainui branch of Waipio Valley; crossing the head of Waimanu Valley to the west side

of Waipio Valley; thence down along said west side of Waipio Valley to the sea; thence along the sea to the point of beginning.

Total area 18,940 acres, less 256 acres, kuleanas and homesteads in Waimanu Valley, and that part of the Ahupuaa of Laupahoehoe owned by the Booth estate, area unknown.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal) DONE AT THE CAPITOL, in Honolulu, this twenty-third day of December, A. D. 1904.

G. R. CARTER,
Governor of Hawaii.

CORRESPONDENCE.

Honolulu, T. H., Dec. 15th, 1904.

Mr. W. M. Giffard,

Commissioner, Board of Commissioners of Agriculture and Forestry, Honolulu.

Dear Mr. Giffard:

It gives me pleasure to transmit to you a resolution adopted by the Board of Commissioners of Agriculture and Forestry, at the meeting held on December 14th, 1904.

The resolution reads as follows:

RESOLVED, That the Board heartily thank Mr. Giffard for the good work which he has done in connection with the publication of the Hawaiian Forester and Agriculturist for the past year, and that they accept, with regret, his resignation as editor.

AND RESOLVED FURTHER, That Mr. Giffard be and hereby is appointed a committee of one to supervise the publication of the magazine in future, with authority, and with the approval of the Board, to appoint Mr. L. G. Blackman of the Bishop Museum, as his successor as editor, subject to supervision and control by Mr. Giffard, as a member and representative of the Board.

Yours respectfully,

C. S. HOLLOWAY,
Secretary and Executive Officer.

APPRECIATION ABROAD.

THE HAWAIIAN FORESTER."

We have received the first copies of the first volume of a most excellent monthly journal, *The Hawaiian Forester and Agriculturist*, issued by the Board of Commissioners of Agriculture and Forestry. It contains numerous very instructive articles on the various fibre-producing plants, articles on forestry, on preparing land for irrigation, on the wattle-growing, banana cultivation, besides many other subjects which possess great interest for all who are engaged in tropical and semi-tropical agriculture. Such a publication is a most welcome addition to the list of official agricultural publications. The September number contains a most excellent article on sisal hemp cultivation, and this is made the more valuable as the actual figures are given showing all the details of expense and profit attaching to the plantation of the Hawaiian Sisal Company since its inception in 1898. We would advise all sisal planters in Queensland to obtain a copy of this number.—"*Queensland Agriculturist*."

APPRECIATION AT HOME.

With the December number there was completed the first volume of one of the most serious purposed, vitally in earnest, and intelligently directed monthly publications in the Islands—*The Hawaiian Forester and Agriculturist*. It is now possible to judge of the purposes of the publication, from the standpoint of its achievement. From this standpoint the purposes have been fully justified. W. M. Giffard, who proposed the publication, marked out its scope and policy, and has conducted it during its first year, may well feel pride in accomplishing a work, praiseworthy in itself and complimentary in the highest degree to him.

Mr. Giffard as a member of the Board of Agriculture and Forestry, conceived the utility of such a publication, and planned it not to be a mere record or gazette of the Board's proceedings, but an active and virile factor in promoting, through research and publicity, those objects which the Board itself was established as the agency of the government to promote. Mr. Giffard proposed as the scope and policy of the publication, to arouse and stimulate interest in the development of other resources of the

Islands than those adapted to and wholly utilized by the sugar industry. This interest was to be aroused and stimulated by suggestive inquiry into the possibilities of those resources; by analogy from other countries not dissimilarly situated; or by deductions from the trade requirements of industries in other countries. The value of these suggestions it was proposed to test by the intelligent application of past experience here, if there had been any such, and by provoking and encouraging direct experiment if there had not been; to give what light could be given to such experimenters by carefully compiled account of experiments elsewhere; and to make permanent record in available form of the results of experiment and the accomplished facts in this field of inquiry. The hope was to broaden and deepen interest in this line of development of the Islands' resources; to increase the number of persons taking an interest in it; to systematize and organize effort; to obtain concrete results; and to preserve for future reference and use both the processes and achievements.

Primarily the periodical has had for its field the forestry, agriculture and entomology of these Islands. But it has not confined its treatment of them to the merely local view point. Whatever could throw light on these subjects, whether the experience of growers elsewhere, the research of scientific institutions or governmental departments, legislation of other countries, trade conditions, business organization, and even such matters as are usually considered more altruistic than practical, such as urban and suburban beautification, have been made to yield results to the purpose and objects of the periodical.

The results have been manifest in many ways. There has been a very largely increased local interest in such matters. Agriculture, which of course includes horticulture, floriculture and other branches of soil cultivation, are held in higher esteem than they were. Outlook has been broadened. Suggestions for new developments of resources are received with more seriousness than they were. Experiment and research have not only been stimulated, but their scope has been broadened and their methods made more scientific. Above all, results have been formulated, and a permanent record made of them so that the greatest known aid to future and well considered investigation and experiment has been given. In every line where experiment has been made, a definite starting point for future experiment has been determined.

In this way each generation of experimenters will not, as they have too frequently done in the past, simply repeat each other, going around in a vicious circle without making any advance.

For the accomplishment of these results, not of course disregarding the support accorded him by his fellow members of the Board of Agriculture and Forestry, nor that of the many persons and agencies who have co-labored and assisted, credit belongs to Mr. Giffard, who out of the exceedingly busy hours of a man of large affairs has given the time, the thought and the labor to plan the publication, and to carry it out at the expense of how much zeal, earnestness, and drudgery, those only can appreciate who have undertaken similar work. Mr. Giffard also has this satisfaction, that the evidence of results of labor and of appreciation of his primary conception, the fertility of ideas he added to it, and of the labor he bestowed on it, are appreciated. The Hawaiian Forester and Agriculturist is appreciated both at home and abroad. Its articles are copied and appreciatively commented on by agricultural journals in all tropical countries. The testimonials to this sort of worth in Mr. Giffard's labors are abundant.

Mr. Giffard now retires from the active editorial charge of publication, though he will still retain his lively interest in it and maintain a supervisory direction of its general scope. L. G. Blackman who becomes now the honorary editor, has been an important contributor during the past year.—The Hawaiian Star.

PRESERVING BOOKS IN THE TROPICS.

The books should be lightly painted over by means of a camel's-hair brush, both outside and inside the covers (and especially along the margins and backs where paste has been used), with a mixture as follows:—

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Bookbinders in the tropics are recommended to use a paste poisoned by adding half an ounce of copper sulphate (or blue stone) to every pound of paste.—Agricultural News, Jamaica.

Vol. II.

FEBRUARY, 1905.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. 2.

FEBRUARY, 1905.

No. 2

The meeting of the Farmers' Institute on Saturday, February 4th, at Kamehameha Schools, was well attended by members of the school, agriculturists and the public generally. Mr. Jared G. Smith, president of the institute, together with President P. L. Horne and Professor W. T. Brigham, occupied the platform of the commodious hall, and after the disposal of preliminary business, Mr. D. L. Van Dine gave an elementary and interesting lecture on entomology. The speaker's chief efforts were directed to the students, among whom he put forth the importance of studying insect life in connection with their agricultural work in the school. The various phases of metamorphosis undergone by insects during their life history were shown by lantern slides, with the object of allowing recognition of economic insects in other forms than those in which their depredation or beneficial effect upon plant life is most apparent. Mr. Henry Davis then presented a paper upon the cultivation of the avocado pear, which was greatly appreciated, and supplemented by Professor Brigham, who showed several models of varieties of fruit he had produced from the same parent stock. Messrs Rhodes and Weedon also spoke on the same subject, recounting their own experiences with the avocado pear, and Mr. Alexander Craw added some practical advice to shippers of the fruit. We hope in the March number to present a full account of Mr. Davis's paper together with the discussion which followed it, and other literature on the subject.

The last address of the evening was by Mr. F. G. Krauss who told of his visit to some dairy farms of California, and described the improvements which are being effected in the modern dairies of that State. The meeting was of unusual interest on account of the amount of practical experience and assistance which were given by the speakers in their several papers.

We have pleasure in presenting in this number the synopsis of an address lately delivered by Judge Weaver, before the Research Club, upon the need of legislation to exempt the family homestead

from forced sale. As the unit in the scheme of civilization and in the foundation of the state, the family should be most jealously safe-guarded by the Legislature. Statutes with this object in view have been enacted in many of the United States, and although this Territory is not altogether deficient in such, these its possessions are either inadequate for the purpose or survive from a time in which the conditions and necessities of the family were much more elementary than those demanded by the exigencies of today. Judge Weaver's paper is the more valuable as it contains a brief review of a proposed bill to remedy the above defect.

The experiments which are being made with a view to the introduction to this Territory of the cultivation of tobacco have caused a great deal of attention to be directed to this industry. As with most other crops in these islands, the control of injurious insects is a most serious obstacle to success. Fortunately, timely action can often reduce or entirely check the ravages of insect pests, and we are particularly pleased to be able to offer in this number the first of a series of articles upon this subject by Mr. D. L. Van Dine, Entomologist of the United States Experiment Station of this city. The articles are written in popular style, unburdened with technicalities, and contain illustrations of the most important insects together with practical remedies for their control.

It is a matter of importance that all papers and data relating to the wide range of diversified industries associated with the cultivation of the soil, should find a permanent record in the pages of a journal exclusively devoted to the interests of agriculture. The necessity of bringing together such matters in a readily accessible form, and the desire to make the "Forester" a complete compendium of all Hawaiian agricultural information of importance, may at times justify the reprinting in these pages of articles which have already appeared in the daily press. An appeal is however, made to writers on Entomology, Horticulture and Agriculture generally, to give the "Forester" the first benefit of publishing their productions. In this way they will insure for their papers the widest possible circulation among readers who are most appreciative of such matter, and will materially contribute

to the success of this journal, by making its volumes an invaluable reference library to Hawaiian Agriculture.

The organization of an Hawaiian Entomological Society last month should furnish an additional opportunity of advancing the practical utility towards Agriculture of this branch of learning. The foundation of the local society is largely due to the efforts of Mr. J. Kotinsky, who has kindly written for the "Forester" an account of its inception and also an outline of its future work.

The publication of the January number was delayed to await the compilation of an Index and Title-page to Volume I. It is intended in future to endeavor to advance the publication of the "Forester" to as early a date in the month as may be convenient.

*A PARTIAL ACCOUNT OF INSECTS AFFECTING
TOBACCO IN HAWAII.*

(By D. L. Van Dine,)

Entomologist, United States Experiment Station, Honolulu.

As there is a possibility of tobacco culture being added to Hawaii's diversified agricultural operations, those interested in the subject should consider the tobacco-feeding insects present in the Islands. Necessarily little can be said regarding their local status or methods that will prove most effective and applicable for their control here. However, the planter's ability to recognize the tobacco-feeding species, the symptoms of their attack and a knowledge of remedies found to be effective elsewhere, will be the principal equipment needed to wage war successfully against the enemies of this crop. Detailed accounts of their life cycle, time, or rather here in Hawaii, *times* of their appearance, their relative injurious importance and definite advice for their control must follow field cultivation.

The writer is indebted to Dr. L. O. Howard, chief of the Bureau of Entomologist, U. S. Department of Agriculture, for the determination of specimens of insects collected or bred from tobacco plants and has relied chiefly on his Bulletin, "The Princi-

pal Insects Affecting the Tobacco Plant,"¹ and the work of Quaintance² in Florida, and Garman³ in Kentucky for the following information:

CUTWORMS.

(Order, *Lepidoptera*. Family, *Noctuidae*.)

The cutworms are the young or larvae of moths whose habits in general are to hide during the day beneath rubbish or in the loose soil and come forth at night to feed. They derive their common name from the fact that they eat through or cut off at the surface of the ground the plants upon which they feed, thus destroying more than they actually take as food. The most destructive cutworms here are species of a single genus, *Agrotis*, some of which are peculiar to the Islands. The native name is peelua, from *pec*, to hide, and *lua*, a hole, referring to the manner in which the "worms" conceal themselves by burrowing into the soil during the daytime. One early writer says:

The origin of the Hawaiian peelua cannot be determined. No person living can settle the date of its arrival, if it ever came. The oldest native when asked the question: "When did the peelua come?" will answer: "Oia mau no." (It has always been here.)

These pests are perhaps the most serious of the vegetable feeding insects and work great destruction in grass lands. Thus far they have proved the greatest pest of the tobacco plants in the Hamakua experimental field, attacking the newly set plants in the field. The most destructive species to tobacco will no doubt prove to be the so-called greasy cutworm.

THE GREASY CUTWORM.

(The larva of *Agrotis ypsilon*⁴=*A. suffusa*, *A. telifera*.)

This insect is widely distributed in Canada and the United States and occurs also in Europe. Howard records it as "one of the tobacco cutworms" and Quaintance believes it to be "the more common insect destructive to tobacco" in the state of Florida.

-
1. Farmers' Bulletin 120, U. S. Department of Agriculture.
 2. Bulletin 48, Florida Experiment Station.
 3. Bulletin 49, 58, 66, Kentucky Experiment Station.
 4. Meyrick, Fauna Hawaiiensis. Vol. I, part II, p. 143.

The eggs are laid in the lower portions of the stem or leaves of various plants and the larvae, on hatching, feed on the young succulent portions of their food plants which, in the cultivated varieties, include nearly all products of the garden and such field crops as tobacco and corn. The larva and adult can be recognized from the accompanying figure.

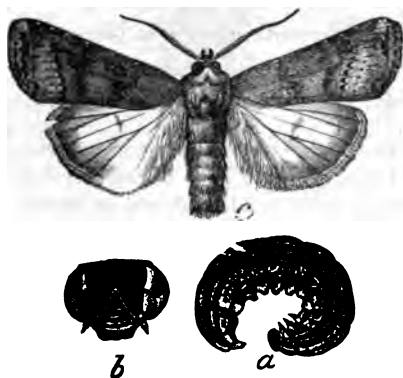


Fig. 1. The greasy cutworm, *Agrotis Ypsilon*; a, larva in characteristic position; b, head of larva; c, adult moth—natural size (From Howard)

The head of the larva is darker than the body, the latter being of a dull brown, varying to gray. It is distinguished by the characteristic greasy appearance of the skin. When full grown the larva is about one and one half inches long. The very young larvae are comparatively slow in their development and may be several months in reaching the advanced larval stages when, because of their increased size and greater destruction, they become conspicuous.

REMEDIES.

To wait until the cutworm makes its appearance in the tobacco field will mean in many cases a loss of a large per cent. of the plants. This insect is to be controlled mainly by so-called poisoned baits applied before symptoms of the insect are noticed or even before the plants are transferred from the seed-beds to the field. Newly prepared lands, especially those recently cleared or adjoining uncultivated areas; areas grown to any of the food plants of this pest; or prepared lands previously given to some "cutworm-crop," will harbor numberless specimens of this and other species of cutworms. The idea in control is to take advantage of the insects' fondness for some substance aside from the young tobacco plants and destroy them by adding to this substance a poison. Dr. Howard says:

After the field is plowed and is bare of vegetation and ready for planting, if the tobacco grower will thoroughly spray a patch of grass or weeds with Paris green and water and will then cut it and drop it in little bunches here and there throughout the tobacco field he will find

that the cutworms in the soil, in the basence of other food, will eat this cut poisoned vegetation and will be destroyed, so that the tobacco plants can be set out without fear of damage.

Since the cutworms work at night the vegetation thus treated should not be cut until towards evening that it may be as fresh as possible.

Another poisoned bait is prepared by mixing Paris Green or some other arsenical poison with bran. Regarding its use against cutworms in tobacco fields, Quaintance says:

This bait should be prepared by thoroughly mixing Paris green with bran at the rate of one pound of Paris green to fifty or seventy-five pounds of bran. Just before a quantity is to be used, it should be moistened slightly with water sweetened with molasses. A small ring of the poison should be strewn around each newly set plant, or a teaspoonful placed at two or three places. The cutworms seem to prefer this even to tobacco of which they are inordinately fond. Where seed beds are badly infested with cutworms, this poisoned bran should be drilled along in various parts of the bed where it will be readily accessible to them. This poisoned mixture should be renewed around the plants about every third day to keep it most appetizing for the larvae. Care must be taken that it is not accessible to fowls or stock.

Since the cutworms are so generally abundant in the Islands and the tobacco-feeding species, *Agrotis ypsilon*, in particular, so destructive, it would be well to apply, as Howard recommends in the case of the poisoned vegetation, the Paris-Green bran-mash mixture to the prepared land several days before setting out the young plants.

THE TOBACCO FLEA-BEETLE.

(*Epitrix parvula*.)

(Order, *Coloptera*, Family, *Chrysomelidae*, or leaf-bettles.)

This widely distributed species is first recorded from these Islands by Dr. Sharp¹ from the islands of Oahu and Molokai on the poha, *Physalis peruviana*. According to Mr. Schwarz of the United States Bureau of Entomology, who kindly identified the insect, the beetle was imported into the Hawaiian Islands from Central America. The writer has received specimens taken from tobacco and has collected specimens from tomatoes. Other food plants are the potato and various weeds belonging to the plant

1. Fauna Hawaïensis, 1900. Vol. II, Part III, p. 95.

family, *Solanaceae*. In appearance the beetle "is a minute oval reddish-brown species." The tobacco grower will be able to recognize the insect by its flea-like manner of jumping when disturbed and the accompanying illustrations.

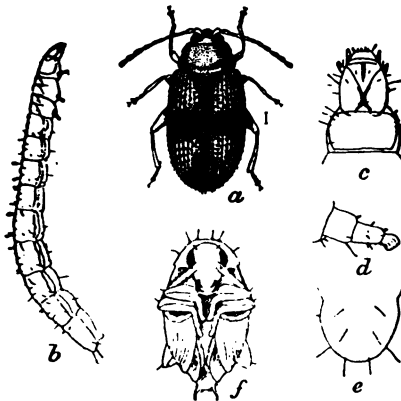


Fig. 2 The tobacco flea-beetle, *Epitrix parvula*: a, adult beetle enlarged about fifteen times; b, young larva; c, d, e portions of larva greatly enlarged (After Chittenden.)

The eggs are laid at or near the roots of the food-plant and the young on hatching enter the soil and feed on the young roots. The adults feed on the leaves of the tobacco. Their work is indicated by either small brown spots or minute holes. The adults are chewing insects and gnaw off and swallow portions of the leaf. As the insects continue feeding these small holes increase in

size and badly damaged leaves become very ragged in appearance.

REMEDIES.

Mr. C. R. Blacow, expert in charge of the tobacco experiments of this Station, states that the flea-beetle usually destroys only the first few leaves of the larger plants and that he has successfully controlled the insect by applications of Paris-green in milk of lime. The standard remedy in the tobacco districts on the mainland is Paris-green applied as a spray in the proportion of one pound of Paris-green to about one hundred gallons of water. In the use of Paris-green the operator should know that the substance is insoluble, or very slightly soluble, in water. The fact that the minute crystals of Paris-green are only in suspension makes it necessary to keep the mixture of Paris-green and water constantly stirred to have the spray of uniform quality. If the mixture is not constantly agitated a portion of the plants will receive little or none of the poison and those sprayed last, that is, with the mixture in the bottom of the outfit will get the larger part of the Paris-green. This undue amount will burn the leaves and cause quite as much damage as the insect itself.

As in dealing with cutworms, preventive measures will be found the most desirable method of controlling the flea-beetle, that is, by precautionary methods keeping the flea-beetle from becoming established in the tobacco field. Regarding this method of control Dr. Howard says:

The destruction of weeds, particularly solanaceous weeds, along the margins of the field, will be of positive benefit in reducing the numbers of this insect, as well as other tobacco insects, unless (and this suggestion we make as one of much possible value), it shall be found feasible to grow a few clumps of nightshade or jimson weed as trap crops for the beetles, the plants to be thoroughly poisoned in the early summer before the tobacco has been set out. The tobacco crop is one of a few which are peculiarly adapted to this kind of remedial treatment. In the ordinary course of tobacco culture the weeds are allowed to grow freely about the margins of the fields. Before the tobacco plants are set out, those weeds which are secondary food plants of tobacco insects, such as *Solanum nigrum*, *Solanum carolinense* and *Datura stramonium*, act simply as concentrators and multipliers of the tobacco insects, so that the insects are already in force about the margins of the fields, ready to transfer their attentions to the young and succulent tobacco plants after they have been planted. From this it is plain that, if the margins of the fields are kept free from such plants, the insects will not have as good a start, and will not be present in such great numbers. It also follows that, if a few attractive weeds are left in clumps, the flea-beetles and other tobacco insects of the immediate vicinity will concentrate upon these few weeds, where they can readily be killed, either by the application of an arsenical poison, if they are gnawing insects, or of a kerosene emulsion, if they are sucking insects.

We have here at least two common plants of this family, the toba, *Physalis peruviana*, and the jimson weed, *Datura stramonium*. Care should be taken not to grow such crops as tomatoes and potatoes adjoining tobacco fields, unless these crops receive the same careful culture as prescribed for tobacco, and after harvesting these crops all stalks and vines should be collected and destroyed.

(To be Continued.)

*NEEDED LEGISLATION TO EXEMPT THE FAMILY
HOMESTEAD FROM FORCED SALE, AND A
PROPOSED BILL TO ACCOMPLISH
THE RESULT.*

BY PHILIP L. WEAVER.

There is no subject of legislation nearer to the private citizen's own interests than that affecting the homestead. Next to getting a home for his family on a secure title, is the ability to keep it through the changes in his financial standing, and the misfortunes that come to all of us. The writers on the theory of the state, on which the practical politician should base his practice, so far as the theories seem wise, make the interest of the family the interest of the State. Following this conclusion, many states of the United States have thrown around the family homestead the protecting arm of the government against the claims of creditors, except certain classes of artisans and such others.

The constitutions of sixteen states have provisions concerning homestead exemptions. At least 32 states have enacted legislation to exempt the homestead. Other states may have done so but I have not been able to ascertain the facts. The methods adopted are various. Some exempt the homestead without any declaration by the householder. Some require a declaration of homestead to be sworn to and recorded that the public may be informed of the claim. Some states exempt from 80 to 160 acres of country land or a city lot with or without a limit on the value of the homestead exemption allowed. Some states exempt country or city lots without limit in area but with a limit of value. In some states the homestead continues exempt after the death of the head of a family and until the youngest child reaches majority, provided the premises continue to be occupied as a homestead.

These statutes vary from an exemption of only \$600 in Indiana to \$5,000 in Texas and California.

Alabama exempts 80 acres of country land, or a lot, not to exceed \$2,000.

California has an exemption of \$5,000 of value, country or city land.

Georgia exempts \$1600 of real and personal property.

Florida exempts 160 acres or one-half acre of town lots.

Indiana exempts \$600.

Idaho exempts \$5,000.

Kansas exempts 160 acres or a city lot.

Louisiana exempts \$2,000.

Michigan exempts 40 acres of agricultural land or a city lot, not over \$1,500 in value.

New York exempts \$1,000 worth of real property.

North Carolina, West Virginia, and Tennessee exempt \$1,000.

Virginia \$2,000, and West Virginia \$1,000.

Other states which have such legislation are as follows: Arkansas, Colorado, Kentucky, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, Pennsylvania, South Carolina, Vermont, Wisconsin.

Homestead exemptions continue exempt after the death of the head of the family in Michigan, North Carolina, Tennessee, Arkansas, West Virginia, Alabama and Louisiana.

Coming to our own statutes of Hawaii, we find that the Civil Code of 1859, under which we are governed to this day, had no exemption of real property as it was enacted. Section 1035, referred to a housekeeper having a family, and exempted furniture of the household. In 1876 this was amended by adding an exemption of a homestead of half an acre where family produce is cultivated and "a houselot not to exceed one-quarter of an acre and the dwelling house and other buildings thereon situated, provided the value thereof does not exceed two hundred and fifty dollars." The exemption does not apply to laborers' and mechanics' liens for building the house. In 1901, Act 9, was a more elaborate law than the old one exempting personal effects of the family from forced sale. This repeals the part of the old statute referring to the household furniture, etc., by general reference only. In all probability a court would hold that the remaining portion just referred to is still in force. But it is a lame statute to rely on.

Now, as to the homesteaders of this Territory be contented with the present law. If their attention is called to the fact that the homestead law of the United States states that the homestead shall be exempt from forced sale, it seems to have the greater force. The homestead law of the United States is a greater law than the law of the Territory. Now we are governed by the law of the United States. The homestead of a citizen of the United States is exempt from forced sale. It seems

to me that it is not too much to ask to require protection for the home to the extent of at least \$3,000 or \$5,000. This would give a home that would be worth \$35 a month as rental, a sum which is modest enough for any family.

To fulfil the purpose of homestead exemption completely states have legislated with various degrees of detail. The Hawaiian statutes are the most meagre of any I have seen.

To carry out the purpose of homestead exemption completely and at the same time prevent people from imposing on their creditors has been the object of such legislation. A bill should contain a provision allowing a person to declare a homestead on any interest in land, even a possession under claim of title, so that the fullest protection be given. The head of a family should be carefully defined to include others than the husband when he is dead.

Full power should be granted for mortgaging the homestead with the consent of both husband and wife, for mortgaging without restraint before a homestead is expressly declared. This latter precaution frees the lender from an onerous duty of knowing whether a house is a homestead before he knows the form of the mortgage to require.

Full protection should be given by lien to parties performing labor or furnishing materials to the home.

The power should be given to the parties to abandon the homestead by declaration, but also the statutes should contain a provision whereby a person having abandoned the homestead can not thereafter claim the protection against a creditor who shows that the property is being used for profit only. The person declaring the homestead should be required to record a statement on oath that the property is worth less than the exemption, that he is using the premises as a homestead, and a description of the premises sufficiently certain to identify them.

In addition to these protections the creditors should be protected by detailed procedure for subjecting that part of a homestead worth more than the exemption to the payment of debts. This procedure should include the opinion of appraisers as to the value, the possibility of dividing the property and setting off the homestead to the family, or the necessity of selling the property and giving to the creditor the excess of the exemption. An important detail, however, must be added to our legislation, al-

lowing the claimant to include a separate taro patch with his home, if necessary.

With a bill embodying these requirements no injustice would be done to either the creditor or the homestead claimant, and I hope that the coming legislature will deem it wise to enact such legislation.

PHILIP L. WEAVER.

THE VEGETABLE GARDEN.

February.

BY F. G. KRAUSS.

While a long list of varieties of vegetables that have succeeded with us was given under "Notes for January," it should be understood that all kinds do not succeed equally well; in fact, a large proportion could probably not be grown profitably in commercial quantities, but for the home garden, where variety is appreciated and cost not so much considered, the majority may prove worthy of trial.

Brief descriptions and general cultural directions follow in alphabetical order of varieties, and at the end of this paper will be found a gardening calendar, based on several seasons' plantings at Kamehameha School Farm, which may prove useful for hasty reference.

TILLAGE.

"Well begun,—half done."

Too much stress cannot be placed upon the importance of thoroughly prepared seed beds, which no amount of after tillage can equal, the extra labor of deep plowing or spading, and the additional time consumed by exposure of the deep, roughly broken ground to atmospheric influences, will be time and labor saved in the end. Such a prepared soil will be free from weeds, deep and mellow, root penetration will be encouraged, warmth and moisture added and conserved, bacterial and chemical activity renewed, the inert food-elements be made available, and the plant stimulated to that rapid growth which, after all, is the magic that produces fine tender and succulent vegetables.

To prepare the seed bed, we know of no better tool than a

strong four-tined spading-fork, with which to break up the soil, roughly at first, then, after the clods have crumbled into a fine granular form through exposure to the elements, the same tool may be used to advantage to incorporate the manure, compost or fertilizer. Another short rest should mellow and settle the soil into a condition fit to receive the most delicate seed, a sharp-toothed steel rake being used for levelling and smoothing the surface, which may be watered to advantage the day previous to sowing. The above, of course, refers to beds; for field culture the plow and harrow would be substituted.

FERTILIZATION.

“From nothing, nothing comes.”

Plants as well as animals must have food, and few soils are so rich but that they will respond to liberal manuring, especially if successively cropped of forced vegetables. But it is not always easy to determine in what form and quantity and at what time and to which crop, fertilizers can be most profitably applied.

Well rotted stable manure, especially if produced from grain-fed animals, is always safe and reliable, and when readily obtainable is the cheapest complete fertilizer known. It may be applied in almost any quantity and at any stage in the growth of crops, tho' preferably before sowing. Fresh stable manure is not in condition for direct application, but should be composted by placing in piles four or five feet high,—in pits and under cover if possible to prevent loss by leaching. A six inch layer of soil between every foot of raw manure or a heavy sprinkling of ground coral, reduces the loss of ammonia to a minimum. The pile should be worked over, and if necessary moistened twice or three times within four months, when it should be in a perfect condition for application to crops.

We use from forty to fifty barrels of poultry manure per annum, which approaches guano in composition, though less concentrated and therefore not so valuable. Much of the nitrogen in the excreta of fowls is in the valuable form of uric acid, which is directly assimilated by plants. To avoid loss by fermentation the fresh poultry manure should be composted with road dust, loamy soil, or ground coral. Care must be taken in the use of poultry manure, a handful or two, to a melon or

squash hill being sufficient for ordinary purposes. It should be thoroughly incorporated with the bottom soil.

Of the chemical manure none is a greater favorite with truckers than nitrate of soda or Chili saltpetre. This salt is at once available as a direct fertilizer, but being readily soluble in water, it is easily lost by drainage through excessive rains or irrigation. It is best applied as a top dressing to growing crops, in several successive applications, 25 to 50 lbs. to 100 feet square, or 100 to 200 lbs. per acre is the usual proportion. It may be dissolved and applied with the irrigation water or mixed with five or ten parts of soil and scattered about the plants, when the first rains will dissolve it. It promotes the development of the leafy part of plants, thus enabling their roots to gather larger amounts of other foods, through its stimulating effect.

Mr. Byron O. Clark of Wahiawa reports excellent results from the application of phosphates in the form of Thomas Basic Slag. This form has an advantage over superphosphates on wet, peaty and marshy soils in that its excess of free lime neutralizes the organic acids of the soil, which probably accounts for its good effects on the highly acid soils of Wahiawa. In recent conversation with Professor E. W. Hilgard of the University of California, our foremost soil expert, he strongly recommended the use of the Basic Slag phosphate on our soils and we intend giving it an extended trial. Five hundred pounds per acre are recommended for general crops.

An Island waste product which may prove useful as a fertilizer is castor bean pomace. It contains from five to five and one-half per cent. of nitrogen, one and one-half to two per cent. of phosphoric acid, and one and one-half per cent. of potash. Castor pomace is believed to have a particularly favorable effect on the quality of the tobacco leaf. At \$8.00 to \$12.00 per ton such material would be a cheap fertilizer, and if applied at the rate of one to two tons per acre should give good results where a nitrogen fertilizer is needed. It will require some experimenting to ascertain what food constituents a soil lacks. In a subsequent paper a simple plan for conducting soil tests with fertilizers, as practiced at Kamehameha School Farm, will be given. Our local fertilizer works can doubtless recommend useful mixtures for general purposes and some experimenting along this line will probably especially repay the market gardener.

Having the ground in the best possible condition, we are ready to sow the best seeds obtainable. The cost between high-grade vegetable seeds and the cheaper kind is so slight, and the dependent results so important that the difference in price is not to be considered. The vitality of seeds may readily be tested between moist blotters placed in a warm situation. If found to be of high germinative power sow more thinly than otherwise.

ASPARAGUS.

Asparagus plants can usually be bought more cheaply than can be raised from seed, with the additional advantage of a year's gain in time. One year old roots may be set in permanent rows three feet apart, a foot apart in the row. Trenches should be deeply dug and heavily manured, a top dressing of one pound of common salt per square yard before growth commences will prove valuable and help to keep down weeds. The crowns of the newly set plants should be four or five inches below the surface. The young shoots may be cut for the table the second season.

GLOBE ARTICHOKE.

Globe Artichokes are grown for their flower heads, which in their immature state are cooked like asparagus. Strong one-year-old plants can be purchased in the San Francisco market at \$2.50 per dozen; but as they do not ship well they may be grown from seeds previously soaked. Set three inches apart in rows 18 inches apart. As they develop, thin out to one foot apart in the row and at one year old transplant in permanent rows three or four feet apart each way.

BEANS.

Beans are among the most important of vegetable crops grown at Kamehameha. Three successive crops can readily be grown upon the same piece of ground during a season which lasts from January till December. We have grown four, and five crops are possible, but rotation should be practiced. A measured thirty-second part of an acre has produced 400 pounds with us. This is equivalent to over six tons of green pods per acre. Three such crops at 2 1-2 cents per pound, would give us \$960.00 per annum. While the cost of labor, fertilizers, etc., is considerable, a handsome profit remains. Such a crop would probably glut the Ho-

nolulu market, but string beans would bear shipment well and command a high price in the San Francisco markets during the winter months.

Beans like a rather dry, light soil, though they generally do well on our heavy soils. For field culture, furrow the soil two and one-half to three feet apart, drop seed every three inches and cover two inches deep. If very mellow, firm soil, water not to profusely, cultivate freely until blossoming time, being careful not to disturb the roots. Pick pods as soon as ready for table, as permitting them to mature shortens the crop. One quart of seed will plant 100 feet of drill, and one bushel, about 60 pounds, is sufficient for an acre. If planted in beds for hand hoeing, eighteen inches is sufficient for rows.

Running or pole beans, are best planted five or six in a hill, allowing each hill three feet apart each way. As soon as the tendrils appear the plants should be staked for best results. Wood ashes and other potash fertilizers are generally of especial benefit to this crop, and may be freely applied to the soil before planting. If to be used as string beans apply 100 to 200 pounds of nitrate of soda to the acre, preferably in three or four doses. This will develop the foliage and pods and retard the ripening of the seed. Succeeding varieties will be discussed in the March issue.

MONTHLY GARDEN CALENDAR.

[Based on 1902-1903 and 1904, plantings at Kamehameha School Farm, Kalihi, Honolulu, T. H.]

JANUARY.—*Sow in a well drained, sheltered location for transplanting:* Artichoke, Asparagus, Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Celery, Collards, Egg Plant, Kale, Okra, Parsley, Peppers, Rhubarb, Tomatoes, Herbs.

On raised beds of porous soil sheltered from winds, sow without transplanting: Dwarf Beans, Beets, Carrots, Sweet Corn, Cucumbers (a few), Lettuce, Peas, Radish, Onions, Turnips. Along water courses: Cress.

FEBRUARY.—*Duplicate all sowings which may have failed in January and in addition plant in open field provided ground permits working:* Beans (all varieties), Sweet Corn, Cucumbers, Endive, Horse Radish (roots), Leeks, Musk and Water Melons,

Onions, Pumpkins, Parsnips, Salsify, Spinach, Squash, Ruta Bagas, Swiss Chard (sea kale).

On well drained land, of a sandy nature, even in exposed situations, plant on ridges rooted or unrooted cuttings of Sweet Potatoes.

MARCH.—All seed and plants sown and planted during January and February may be duplicated in March with good results; especially if the preceding months were excessively wet and windy does March planting promise well. This is a good time to transplant. Also sow main crop of beans, sweet corn, melons, pumpkins, squash, etc.

APRIL.—March recommendations apply to April, though insect pests now begin to put in appearance.

MAY.—Beans, corn and the melon tribe thrive from May plantings provided ample water is available for irrigation, and the insect pests are kept down.

NOTE: On May 1st, 1903, the following vegetables were harvested at Kam. Farm: Beans, beets, carrots, sweet corn, cabbage, lettuce, squash (in variety), Swiss chard, sweet potatoes, young onions, tomatoes, etc.

JUNE.—Beans and squash (of the latter, the hard skinned sorts) do fairly well from June sowings. Aphis (green and black) makes it difficult to grow corn at this season. Tomatoes begin to show effects of the fly, likewise tender skinned squash.

JULY.—Little or no planting is done during July at Kamehameha. Last of the summer crops have been harvested, pest ridden rubbish burned and the surface ground plowed under and left in the rough for a well earned rest. A previously fallowed patch might be sown to beans and possibly corn and squash.

AUGUST.—August is a good month to give the major part of the vegetable garden a vacation. Excessive watering and cropping have compacted and tired the land. Plow up and leave in the rough or plant to velvet beans if you can spare the land and plow under in October. It is better and cheaper than commercial fertilizer in our soil at Kamehameha.

SEPTEMBER.—To have squash and pumpkins, also sweet corn on Thanksgiving Day, sow in September. We have had fine results from such plantings the past year (3,000 lbs. Hubbard and Gold o' Heart squash raised on 1-3 acre; 108 doz. ears choice

Mammoth sweet corn from 1-2 acre). However, the past has been an unusually favorable season with us.

OCTOBER.—None but quick maturing crops should be planted from now on, excepting perhaps a small patch of sweet corn for Christmas; beets, carrots, radish, lettuce and onions and Swiss chards may be planted every month in the year, October not excepted. Plant some beans by all means, they may then be had for the table during Nov. and Dec.

NOVEMBER.—If you have a patch of light soil that can be spared for four or five months, plant to sweet potatoes; they will withstand all kinds of winter weather, protect the soil from washing and produce a good crop of tubers during Feb. and March. Such was our experience during 1902-3 and we are working on that basis now. Make sowing of all the hardy, quick maturing vegetables.

DECEMBER.—December is a busy month at Kamehameha Farm. Our land has now had a month's rest, the rough clods have turned to mellow soil and seems eager for new labors. Barnyard compost is applied and this is turned under, a little sub-soil is brought to the surface, two weeks of sunshine mingled with showers, and the surface foot is again ready to receive the seed. Being venture-some we sow all that appears under January. If the season is open, and it generally is favorable we have good chances of gaining a month, perhaps two months, on the new year.

The following are vegetables harvested Dec. 31, 1903, and Jan. 1, 1904: Beets, carrots, beans, sweet corn, lettuce, radish, squash, Swiss chard, tomatoes, turnips, papaias and bananas.

F. G. KRAUSS.

STREPTOCARPA FRUITS SUITED TO CULTIVATION IN HAWAII.

The fruits of the Streptocarpa will be seen in the accompanying photograph. They are very profitable to the Hawaiian people, and many residents of the islands are engaged in their cultivation. The remunerative value of the fruit is such that it is well arranged for the Hawaiian people to be able to rely on the fruit as a source of income. In connection with the fruit, the Hawaiian people are also engaged in the cultivation of the fruit from

fruit growers, either of those varieties already noticed, or more especially of others not yet described in these pages.

NO I, THE LONGAN.

In the order Sapindaceae is a genus, *Nephelium*, containing 49 species native to China, India, Burmah, Malaysia and Australia; its range seems to be from 35 degrees North to 30 degrees South, or roughly speaking about 10 degrees beyond both the Tropics. Several of the species are cultivated for the fruit, the aril—the pulpy mass surrounding the seed—of which is tender and juicy, and of a very delicate flavor. The species most generally cultivated are:

Nephelium lappaceum Linn., a native of India called *ramboutan*,

Nephelium longana Camb., native to East Indies and Burmah according to Hooker and Jackson, but DeCandolle states it was introduced there from China.

Nephelium litchi Camb., native of the south of China.

Of these three species two have been growing in Honolulu for several years past and have been profitable trees to their owners on account of the demand by the Chinese for the fresh fruit. The trees bear several hundred pounds of fruit which retail at from 25 to 40 cents per lb.

Nephelium litchi, the lichi or lichee of commerce, is best known to the public by its dried fruit, so generously and widely distributed by the Chinese in Honolulu during their New Year's festivities. It is a tree of symmetrical growth, with spreading branches and lanceolate leaves, and grows to a height of 20 to 25 feet; the foliage is thick and of a dark green shade. The fruit when fresh is in size from 1 to 1 1-2 inches in diameter, of a light reddish brown, with the aril completely filling the space between the shell and the oblong seed. The outside skin or shell is tough and covered with small tubercles. The fruit is eaten fresh or dried, but in the latter condition most of the delicate flavor is lost. The Chinese have a method of preserving the fruit in syrup, which retains the fresh flavor so much desired. The litchi is cultivated in China, India, Japan, Malay Peninsula and the West Indies, and there are trees growing in Honolulu on Nuuanu street, at Kalihi, Moanalua and Luakaha.

Nephelium longana, longan or dragon's eye, is a taller tree than the litchi, reaching a height of 30 or 40 feet, and of similar appearance. It is also hardier. Its fruit is slightly smaller than

that of the litchi, ranging from 3-4 to 1 1-4 inches in diameter and the color is less reddish. The shell is externally smooth or slightly tubercled and the seed is nearly round. The flavor is better than that of the litchi and as fresh fruit the Chinese prefer it to the latter since large quantities of the longan can be consumed



The Longan ($\frac{1}{2}$ Size).

without bad effects, but too many litchis make them ill. The fruit does not seem to be much used in the dry preserved state, probably on account of its smaller size. It is cultivated in the South, Southeast and East of Asia, the Malay Archipelago and the Philippines, and also in Japan. It is more easily grown than the

litchi. The wood is white, hard and close grained and is used in Japan and India for furniture and in Ceylon for house building. There are probably 30 trees growing in Honolulu and thriving.

Since both of these species grow readily from seed, it is a matter of some comment that with the large Chinese population they have not been more plentifully planted in the Hawaiian Islands. They are handsome trees and make a good shade, thrive well in this climate and soil and when in bearing prove most profitable. It is possible that the time required for the seedlings to bear has discouraged those enquirers who in this country seem to prefer a fruit tree which will bear in a very few years. However, grafting or layering would overcome this drawback, and there are enough mature trees in Honolulu now for these processes. Writing of the litchi, Dr. Bonavia in the Pioneer (India) said: "Here is a fruit tree, which resists the heaviest rains, and stands the hottest winds, and also the frosts of these provinces (North-west Provinces). Moreover, it bears annually an abundant crop of fine, well-flavoured and aromatic fruit, which can readily be sent to distant markets without injury. Instead of being planted by the one or two, it should be planted by the thousand. From all I know of the hardiness and fruitfulness of this remarkable tree, I feel confident that if any individual (or company) possessing the necessary capital, were to plant an extensive orchard of litchi trees, say where canal water would be easily obtained, or where well water is within easy reach, he would very probably make a good life-long business of it." In commenting on Dr. Bonavia's article another writer, Dr. George Watt, says: "This result has abundantly been attained in Bengal, and although statistics of the extent of the trade cannot be given, it may be said that in the Lower Provinces the litchi tree is almost co-extensively cultivated with the mango. It comes into season a little before that fruit, and in the larger cities such as Calcutta is sold in every fruit-dealer's shop, the streets for a month or six weeks being literally bestrewn with the rind and large seeds, rejected by the way-side consumers. The fruit to be enjoyed must, however, be eaten as soon after being plucked as possible. When fresh, the great bunches look like bright pinkish strawberries, but they rapidly lose their bloom and assume a dirty brownish colour. The dried fruit, as sold in Europe, bears no possible resemblance to the deliciously bitter-sweet pulp of the fresh litchi."

*ORGANIZATION OF THE HAWAIIAN ENTOMOLOGICAL
SOCIETY.*

Not long after landing in this city it occurred to the writer that, in view of the number of entomologists whose profession is also their means of gaining a livelihood, it would be advisable to organize an entomological society. The advantages to be gained by the occasional meeting of all those persons were obvious. Linked by ties of similar interest, an exchange of ideas, intercommunication of experiences and observations, and finally the promotion of friendly relations between them is bound to result in mutual benefit. Economic entomology being their daily pursuit, an occasional evening spent in the discussion of other phases of the science can serve but as a pleasant kind of relaxation from the toils of the day. The other entomologists to whom the subject of an organization was broached signified their pleasure at the prospect. Encouraged by the promise of success, invitations were sent out to all those that were considered interested in the subject, and the first meeting was held at the Government Nursery Building on the evening of December 15, 1904. The officers elected for that evening were: Temporary chairman, G. W. Kirkaldy; temporary secretary, J. Kotinsky. Present at that meeting, in addition to the officers elected, were Messrs. Craw, Terry, Hosmer, Austin, Swezey, and Mrs. Swezey. Upon a motion made, the chair appointed the following to draw up a constitution: Messrs. Craw, Terry, Kotinsky. This constitution was to be read at the next meeting, which it was decided to hold at the same place on a Thursday of the next month.

The second meeting of the proposed Hawaiian Entomological Society was held at the place agreed upon on Thursday, Jan. 26, 1905. The temporary officers of this meeting were:

Chairman, Mr. R. C. L. Perkins.
Secretary, Mr. Jacob Kotinsky.
Acting Secretary, Mrs. Swezey.

After reading and approval of the minutes of the last meeting the constitution was read and article by article discussed and voted upon. Following is the constitution of the Hawaiian Entomological Society as finally adopted:

CONSTITUTION.

Article I.—Name.

The name of this organization shall be THE HAWAIIAN ENTOMOLOGICAL SOCIETY.

Article II.—Objects.

The objects of the Society shall be to promote the study of entomology in all possible bearings, and to encourage friendly relations between those in any way interested in the science.

Article III.—Members.

The Society shall consist of active, corresponding, and honorary members. No corresponding members shall be elected from residents on the Island of Oahu. The names of candidates for membership shall be brought before the society at a regular meeting by either an active member or the secretary, to whom application may be made. These candidates shall be balloted for at the next regular meeting of the Society. A majority vote of the active members present when the ballot is taken shall be necessary for election.

Article IV.—Officers.

The officers of the Society shall be a President, Vice-President, and Secretary-Treasurer, to be elected by ballot at the annual meeting, except the Vice-President, who shall be appointed by the President at the same meeting. There shall be an Executive Committee, consisting of the officers of the Society and two members to be elected by the Society.

Article V.—Duties of Officers.

Section 1. The President, or, in his absence, the Vice-President, shall preside at the meetings of the Society and of the Executive Committee. It shall be the duty of the President to deliver an address at the closing meeting of the year.

Sec. 2. The duties of the Vice-President shall be to perform all duties of the President in the absence of the latter.

Sec. 3. The Secretary-Treasurer shall take and preserve correct minutes of the proceedings of the Society, preserve all publications and other property belonging to the Society, conduct all official correspondence of the Society, keep a list of all members together with their addresses, solicit papers and notes for

the meeting; give due notice, in writing, of all meetings at least three days in advance; shall have charge of all the moneys of the Society, and shall make disbursements only under direction of the Executive Committee; he shall collect all fees and assessments, and notify all members who are in arrears, and submit a report of the finances of the Society at the annual meeting or whenever called for.

Sec. 4. The affairs of the Society shall be conducted by the Executive Committee, whose duty it shall be to have direction of the finances, audit the accounts of the Secretary-Treasurer, provide for publication, and transact any other necessary business.

Article VI.—Meetings.

Five members shall constitute a quorum. The regular meetings, are to open 7:30 p. m., and shall be held, unless otherwise ordered, on the first Thursday evening of each month. The annual meeting for the election of officers shall be the regular meeting for the month of January. The nominations for officers shall be held the preceding meeting. Special meetings may be called by the Executive Committee.

Article VII.—Fees.

The annual fee for acting members shall be five dollars, payable upon election and at each annual meeting thereafter, unless such election take place after the last day of September, when no fees are to be collected for that year. No fees are to be collected from corresponding members, or ladies who are active members. Any member in arrears for one year may, after due notification, be dropped from the rolls. No member in arrears shall be entitled to vote.

Article VIII.—Amendments.

The Constitution of the Society may be amended at any regular meeting by a two-thirds vote of the active members present, specific notice of such amendment having been given in writing to all active members at least one month previously.

Article IX.—Order of Business.

The order of business of the regular meetings, unless otherwise ordered by the Executive Committee, shall be as follows:

- 1.—Reading and approval of minutes of last meeting.
2. Reports of officers and committees.
3. Election of members.
- 4.—Miscellaneous business.
- 5.—Reading of papers and discussions.
- 6.—Notes and exhibition of specimens.
- 7.—Motion to adjourn.

The following are the officers for the ensuing year :

President—Mr. R. C. L. Perkins.

Vice-President—Mr. Alexander Craw.

Secretary-Treasurer—Mr. Jacob Kotinsky.

Executive Committee—Messrs. Otto H. Swezey and D. L. Van Dine.

Mr. Van Dine presented the name of Albert Koebele for honorary membership. Mr. Koebele was elected with a hearty and unanimous vote.

Quite of interest is the fact that in this little society are represented the three leading schools of workers in Economic Entomology, viz: the school of inspection and exclusion of injurious insects, the one advocating the importation of beneficial insects, and finally the old school that urges cultural methods and artificial remedies to check the ravages of injurious insects. The probability is, however, that the monthly meetings will be devoted more to the discussion of technical notes and papers rather than economic questions unless these are of great compass. In other words, principles rather than practice will be the absorbing topics.

The Society is thankful to the Board of Commissioners of Agriculture and Forestry, and particularly to its executive officer, Mr. C. S. Holloway, for the kind permission to use the Board room for the meeting of the Society.

JACOB KOTINSKY,
Secretary-Treasurer.

THE CULTIVATION OF SPONGES.

During the past two or three years a very interesting series of experiments has been undertaken on the Florida coast by the United States Fish Commission to determine the possibility of the cultivation of sponges. It is reported that the result of the investigations shows that the industry, if properly conducted, is one likely to yield large profits. The superior advantages offered by the uniformly warm temperature of the Hawaiian seas should justify similar experiments being conducted here. In this, as in many other industries, which have been recommended as suitable for introduction to these islands, the question of success does not so much lie in climate or suitable site (for these are afforded by our varied elevations suited to industries of the most diverse kind), but in the need of progressive and capable men. To the latter, the cultivation of commercial sponges is recommended as a project deserving of serious consideration. The protection of the coral reef, especially in secluded inlets, appears to afford an ideal condition for the growth of sponges. The commercial value of our native species has, we believe, not been thoroughly investigated. From time to time Hawaiian specimens of fair quality are seen, but whether these are of sufficient value, or occur in numbers to repay the expense of collecting them, is questionable. However this may be, the artificial propagation of choice imported species is to be preferred, as by this means the production of symmetrical sponges of uniform quality and highest commercial value can be relied upon. The expense of establishing a colony would also be considerably less than that entailed in ordinary collection, which furnished sponges of various sizes and grades, and is at the best precarious.

The method of establishing the sponges is by suspension to a wire held a few inches above the bed of the sea. In this position the sponges are held above the attrition of sand and other moving obstacles, and are free to grow equally in all directions and to acquire a regular spherical shape. The young sponges are obtained by cutting small pieces from a mature specimen and attaching them at regular intervals along the wire. Care is taken that each section bears a portion of the external epidermis of the parent sponge. In about eighteen months the sponges should have gained about 25 times their original bulk, and may then be

marketed, although, if allowed to remain longer they will continue to grow and to increase in value. The chief difficulties which attended the series of experiments alluded to, were associated with obtaining a wire capable of resisting long immersion in salt water, and in discovering the best means of affixing the sponges. Both these problems have been satisfactorily solved and under normal circumstances the percentage of sponges which attain maturity is from 45 to 95. The best results were obtained in waters which contained a super-abundance of saline constituents.

The most valuable sponges are imported from the Mediterranean, and large quantities, though of less value, are procured in Floridan and Cuban waters. Next to texture, the shape of a sponge adds most to its price, and as the former quality is a question of selecting the best commercial variety and the latter may be greatly controlled by proper cultivation, the proposed industry, if successful elsewhere, should surely be most remunerative when conducted in the warm waters of the reef-protected openings of these islands.

MONTHLY LIST OF AGRICULTURAL PAPERS.

The following list while in no way attempting to be exhaustive, is prepared in order to bring before our readers such publications and papers as are brought to notice during the month, and relate to matters of local interest. The list is compiled from various sources, including the literature of the U. S. Department of Agricultural and the different Experiment Stations, the papers read before societies and the articles appearing in the Agricultural Journals. We shall be glad to assist correspondents in procuring any of the following:

U. S. Department of Agriculture, Bureau of Forestry. Press Bulletins: No. 60. "Lumbering in Forest Reserves." "Forestry in California." No. 61. "A Porto Rico Forest Reserve." "Colorado Practicing Forestry." No. 62. "The Strength of Lumber treated with preservatives."

Office of Secretary: Circular No. 12. "Adulteration of Alfalfa Seed." Crop Reporter December 1904, "Rice Crop in the U. S."

Hawaiian Section, Weather Bureau. Weekly Crop Bulletins. Hawaii Agricultural Experiment Station. Press Bulletin. No. 11. "The Common Liver Fluke in Hawaii" by Jared G. Smith and D. L. Van Dine.

Farmers' Institute. Papers presented Feb. 4th. "Cultivation of the Avocado Pear" by Mr. Henry Davis. "Some Modern Dairy Farms" by F. G. Krauss.

Miscellaneous.

"The Gutta Percha and Rubber of the Philippine Islands" by Penoyer L. Sherman, Jr., Ph. D. 1st Part. *Far Eastern Review*, Manila, P. I. September, 1904. 25 cents.

(The material for the above was collected under the direction of the Bureau of Forestry and of the Bureau of Government Laboratories. The article is fully illustrated with half-tones and maps, and the subject is thoroughly treated. Ed. Forester).

"Agave Fibres," *Indian Planting and Gardening*. Calcutta, Vol. XIV., No. 49. 8 annas.

"How to Beautify Your Town," *Home and Flowers*, Vol. XV., Nos. 3 and 4.

"Sweet Potato Trials," *Bulletin of the Department of Agriculture, Kingston, Jamaica*, Vol. II, part 12. 3 pence.

THE DANGER OF INTRODUCING INSECT PESTS.

(The following article, reprinted from "Indian Planting and Gardening" is so pertinent to our local conditions that we present it in full.)

The study of the Insect Pests attacking crops in India has shown that whilst many are probably indigenous to India or countries adjacent to India, a few at least have in all probability been introduced from foreign countries more or less remote. In fact, it is probable that in many countries have found it necessary to import insects to destroy the Insect Pests which are doing damage to their crops. In India, on the other hand, the diversity of the climate and the diversity of the crops has made the danger less serious. The virulent insects which are found in other coun-

tries and the increasing speed with which merchandise is transported, this danger has now become formidable and it is reasonable to suppose that in the absence of all precautions, very virulent Pests may be introduced which, if allowed to propagate unchecked, might work great damage among the staple crops and cause great losses to the country. This is the experience of other countries, notably of the United States where the outbreaks causing losses estimated to amount to millions of dollars have been traced to importations from Europe.

Insects in their natural habitat, are checked by natural enemies, without which their increase would be enormous. These insects when introduced to fresh places, have perhaps no enemies, and their increase then proceeds unchecked, sometimes so rapidly as to make the insect in its new home, a dangerous pest. Sooner or later, in their new habitat new enemies attack them and play the part of the enemies in their original habitat, but this may not take place for a long period during which their destructiveness may be very serious.

Many insects have been carried in ships and have now become cosmopolitan. These include the common cockroaches, the beetles and moths that attack grain, flour, stored provisions, etc., and the common household pests which are inevitably spread by commerce. Against these no practical measures can be taken, the bulk of the merchandise in which they come being so large. The danger that can be guarded against lies especially in the plants, seed, tubers, etc., which are imported for planting. As insects on such things are placed in the best possible conditions for thriving and are introduced directly to the growing plants on which they live, the interests of agriculture generally are directly involved. Cotton seed from the United States is extremely likely to carry the cotton boll weevil, perhaps the most formidable pest of cotton in the world at the present time. The United States Department of Agriculture is spending large sums in checking this pest and its yearly ravages are said to cause damage estimated at millions of dollars. Similarly sugarcane imported for planting is likely to carry borers, or caterpillars which work so much havoc wherever present, but the West Indian, the Australian, the Javan, the Mauritian species are not known in India and it is necessary to take precautions against their introduction.

The following are the chief imports in which insect pests are

likely to be found and the best methods available for treating them are given in each case.

Living Plants.—Many insects are carried on living plants or in the soil or packing in which they come. These should be carefully unpacked, not out of doors, but in a room or a veranda, where the presence of insects can be easily detected. If the plants are healthy, they may be planted out, preferably in secluded corners in quarantine, so that diseases developing may not pass to neighbouring plants. It is advisable to dip all such plants in one of the mixtures given below.

If the plants have scale on them, mealy bug, blight or other unhealthy appearances, they should be dipped in the mixture (A) and then planted in quarantine; if the disease grows beyond control the plants should be burnt. If the disease lessens they should be treated with the mixture A, by spraying or sprinkling them till the disease disappears and the plants are healthy.

The package and the packing material should be burnt. If insects of any kind are found on opening the package, the whole inclusive of the plants should be put on the fire; the insects may be harmless or not, but it is impossible to be certain in any particular case.

Roots, Tubers, Bulbs.—These should be treated much as the living plants, but as they are more likely to harbour beetles, borers, etc., a few should be broken or cut open to see that they are sound. They should, in all cases, be dipped in mixture A or B, and in the case of tubers such as potatoes this should be made of double strength.

Cane.—Sugar canes should be carefully inspected; canes in which holes or boring insects are found, should, be burnt; those on the outside of which scale, mealy bug or any appearance of blight is discovered, should be dipped in mixture A or B of double strength, and the dipping repeated daily till they are planted.

Seeds.—Seed should be fumigated with benzine or carbon bisulphide. They should never be planted till that has been done in the following manner:—Place the seeds in an air-tight box with a big wad of cotton and pour benzine or carbon bisulphide on the wad; the latter is preferable and should be used at the rate of one ounce per fifteen cubic feet, or one drachm (teaspoonful) per cubic foot. Benzine is used at the rate of 1 1-2 drachms per

cubic foot. The box should be kept closed for twenty-four hours, and should not be approached with a naked light.

The radical and scientific method of treating all plant imports is by fumigation with hydrocyanic acid. This is the measure practised in Ceylon, the Cape, the United States, Germany and many other countries. Botanic Gardens, Nurseries or other establishments that import large numbers of living plants should fumigate everything that comes in from abroad. The method is simple and easy; and complete information can be obtained from the Entomologist.

Other importers of living plants and other articles likely to harbour pests, who may not have facilities for fumigation can by the exercise of a little care and common sense and by the use of the simple measures given above, do much to remove the risk of importing diseases, and their co-operation in this matter is solicited in the interests of the public generally. There has been a great increase in plant importation during the past few years, and year by year the danger grows greater. Some importations have been actually seen to bring pests, which would have been liberated if not noticed, and as many of these pests are likely to escape notice it is best to treat every importation of living plants or parts of plants which are to be used for planting. Importations solely for food, such as apple, potatoes, etc., are less likely to be dangerous since the insects would not be placed in conditions suitable to propagation, but every plant or seed imported and put into the ground is a danger unless properly treated and disinfected.

Mixture A.—Boil 1 1-2 lb. sliced hard soap (bar soap) in one gallon of water till it is dissolved. When boiling, take off the fire, throw in two gallons of kerosine and agitate it till the oil and soap solution form a creamy fluid, with no free oil. The simplest way to agitate it is to pump part violently into the main quantity with a syringe, but continued heating and whisking will have the same effect but take longer. Mix one part of this with seven of water before use.

Mixture X.—Boil 1 1-2 lb. of rosin, 3-4 lb. washing soda in a small quantity of water in a kerosine tin till dissolved. Continue boiling and add cold water very slowly till the tin is half full of liquid. It will froth up and become extremely thick; after some time if kept boiling steadily, it will become thin and clear; boil for

a few minutes longer and mix with four gallons (one kerosine tin) full of water before use.

H. M. LEFROY,

Entomologist to the Government of India.

Surat; the 5th August, 1904.

LANTANA BLIGHT.

We notice that the black blight on the lantana still survives near the half way bridge on the road to Koloa. This was presumably brought from Maui and dropped there by some passer by who was willing to experiment with it on some one else's property.

Some months ago the Grove Farm plantation, to whom the land belongs, looking on it as a menace to the Island, at considerable expense cauterized it out root and branch.

But now it is back again worse than before, and we understand it is to be allowed to remain, the Maui people having given assurance that it positively will not affect anything but lantana. Just what security the Maui people offer with this guarantec we have not heard. The entomologists have warned us against this blight, and we ought not to take the risk it involves so long as we can avoid it. The Lord preserve us from any more blights to denude and deface our fair Island—"harmless" or otherwise. Let us root it out before it gets beyond us!—*Garden Island.*

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No. 3.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. 2.

MARCH, 1905.

No. 3

The paper on the Avocado Pear, read by Mr. Henry Davis before the last annual meeting of the Farmers' Institute, appears in this number, and is followed by some suggestions to exporters by Mr. Alexander Craw, and also by the report of the New York agents on a recent shipment of the fruit from Hawaii. Further notes from experienced growers of the Avocado Pear are being prepared for publication in a subsequent number. The combined information contained in these articles will represent almost all that can at present be written upon the cultivation in Hawaii of this esteemed fruit, and it is hoped that it will be of use to our readers, and will encourage the extensive planting of a tree which promises such a profitable return.

In the public parks of many cities the excellent practice of fastening the names of trees to a neat and unobtrusive tablet at the foot of the trunk, has long been followed. The plan has been adopted chiefly in Botanical Gardens, where most of the plants are unfamiliar to the ordinary observer; but for the same reason it would be equally appreciated if extended to the squares and parks of Honolulu. While many well-known trees can not be identified by a large number of our own residents, to a visitor the names of most ordinary palms and plants are often altogether unknown. In former years large quantities of exotic seeds, gathered frequently at hap-hazard, have been introduced to this country and allowed to grow up promiscuously, often with even their original habitat forgotten. As a consequence, the old gardens of Honolulu abound in many strange and interesting plants, the names and properties of many of which are not known even by their owners. In some few cases, indeed, specimens have been discovered of undescribed and hitherto unrecorded species. As an example of the interest which might be awakened in Botany, Forestry, History, and kindred subjects, may be cited the inscription exhibited in the yard of the Catholic Cathedral. Very few residents of Honolulu, or visitors from abroad, are unfamiliar with the gnarled trunk of the first *Algroba* tree in Honolulu, planted by Father Bachelot.

A curious and not unnatural misconception is sometimes met with, viz: that the koa tree (*Acacia Koa*) possesses two different kinds of leaves. Strictly speaking, it might be said that the mature tree has no true leaves at all. The foliage of the young tree at first bears the characteristic pinnate form of most *Acacias*, but as larger growth is attained, this gives place to what apparently are simple leaves. A close inspection of a young koa will, however, reveal the true character of this later foliage, which is nothing more than the dilation of the petiole, or leaf stalk, into a leaf-like organ called a phyllode. This modified petiole performs all the functions of a true leaf and its development is accomplished at the expense of the latter, which dwindles gradually and then completely disappears. This dual process, the development of the phyllode and disappearance of the leaf-blade, is often beautifully illustrated on the same twig. The mature koa as a rule possesses no true leaves except on adventitious buds near the base of the trunk. The *Acacias* are a large genus of trees, centering for the most part in Australia. The four Polynesian species all develop phyllodia. The latter generally present their edges, instead of their surface, to the sun, and their development, which is not confined to the *Acacias*, has possibly been necessitated to prevent too great loss of moisture in countries subjected to prolonged drought and intense heat.

An arrangement which should be appreciated by all interested in Agriculture, has been made whereby the papers and addresses delivered before the meetings of the Farmers' Institute shall be first published by the Forester. We wish to accord our sincere thanks to Mr. Higgins, Secretary of the Institute, for his co-operation in bringing about this beneficial arrangement.

Mr. D. MacIntyre of Moanalua, who has for some time been engaged in experimenting with the grafting of mango trees, has very kindly undertaken for the Forester the preparation of an article in which he will embody the results of his work.

We are pleased to be able to announce the preparation of articles by competent writers for the Forester on the following subjects: "The Mangosteen," "Cultivation of Vanilla," and "The Rubber Tree in Hawaii."

Mr. F. W. Terry's series of entomological articles, omitted since last December, is continued in this number.

A correspondent from Honokaa, Hawaii, has written requesting information as to literature upon the raising and marketing of frogs. We shall be glad if any of our readers can enlighten us upon this matter.

MONTHLY LIST OF AGRICULTURAL PAPERS.

The following list, while in no way attempting to be complete, is prepared in order to call attention to such papers as are brought to notice during the month, and relate to matters of local interest. We shall be glad to assist in procuring any of the following:

"*First Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii*," July, 1903—Dec., 1904. 8 vo.; pp. 170. Honolulu, 1905. This publication will be treated at length next month.

"Factors for Success on the Farm," by R. Caldwell. "Bee Keeping as a Side Issue." *Journal of the Department of Agriculture*, Western Australia, Perth. Jan., 1905. 3 pence.

"The Forest Policy of France," excerpts from speech by M. J. J. Jusserand, French Ambassador, at meeting of American Forest Congress. "Communication in Regard to Cause of Droughts," by X. X. *Forest Leaves*, Philadelphia, Feb., 1905.

"Cultivation and Tapping of the Castilloa Rubber Tree." *The Tropical Agriculturist*, Colombo. Jan., 1905.

"Nitrogen in Agriculture." Extracts from speech by Dr. Somerville, before the British Association. *Bulletin of the Depart. of Agriculture*, Kingston, Jamaica. Jan., 1905. 3 pence.

"Why Grow Inferior Mangoes?" by Albert H. Benson. "An Effective Stump Eradicator." *Queensland Agricultural Journal*. Feb., 1905.

"Good Types of Dairy Cattle" (South Devon and Shorthorn) by M. A. O'Callagan. "The Settler's Guide, Continued, Tools," by Robert Kaleski. *Agricultural Gazette of New South Wales*, Sydney. Feb., 1905.

"What a Strawberry Specialist Saw in Texas." "Strawberry Culture that Brings the Extra Dollars." *The Florida Agriculturist*, Jacksonville, Feb., 1905. 5c.

"The Castor Oil Plant in Ceylon." "Job's Tears." *Indian Planting and Gardening*, Calcutta. Dec., 1904. 8 annas.

THE CULTURE OF THE AVOCADO PEAR.

(Address before the Annual Meeting of the Farmers' Institute of Hawaii, Feb. 4th, 1905.)

BY HENRY DAVIS.

I have been invited to read to you this evening a paper on the subject of the "Culture of the Avocado Pear." I regret that I have not been able to devote sufficient time to the subject, to be able to present my ideas to you in a literary style. Let it be understood that my remarks are the result of individual investigation, and that I lay no claim to infallibility on the subject.

It may not be superfluous in introducing my subject, to remark on such correlative matters as the origin and distribution of the tree. It would appear from authoritative botanical sources that the Avocado pear is a native of tropical America, extending from Mexico to Peru, the tree and fruit attaining its greatest perfection in the sheltered valleys of the Coast Ranges, at elevations of from two to three thousand feet. The original habitat of the tree, according to De Candolle, an eminent authority, is Mexico, but we can readily imagine how individuals, including explorers, navigators, emigrants, scientific men, and other agents, have, within the last two hundred years, introduced and transplanted in every portion of the world the flora of some other section.

Assuming, therefore, that Mexico is the home of this fruit, we find it is now highly esteemed and cultivated in every sub-tropical country in the world. It flourishes in the Dutch, English, and French East and West Indies; on the mainland of America from Mexico to Peru; in the Madeira, Azores and Canary Islands; the Mediterranean States of Northern Africa, and the West coast and sub-tropical States of the same continent.

This preface to my main subject is presented with the view of reminding you that while the information may be comparatively new to many of us, nevertheless the tree is pretty well known and cultivated throughout the tropical world. I have not been able to procure any authoritative information as to whom we are indebted for having first introduced it into these Islands. But evident it is to my mind, that we are indebted to no one individual, but rather to a large number, who in their return to their Island home, from tropical wanderings, have instinctively en-

riched this garden spot of earth with many beautiful and rare exotics.

I will now endeavor to explain to you what I have done in the way of modest experiment at my suburban home at Punahou. Many years ago I purchased of Prof. D. D. Baldwin our present home, a lot 200x400 feet, in the block opposite the campus of Oahu College. This rather roomy lot, without any cultivation, offered both my wife and myself ample opportunity to indulge in tree-planting. I presume in the early stage we did exactly the same as most people have done, and have had to learn from experience. We made many mistakes, such as leaving inadequate spaces between plants; planting of palms among fruit trees, and so forth. However, to revert to the subject of my address, I would recommend as a primary essential to success in the cultivation of the Avocado pear the selection of land well sheltered from strong winds—preferably valley lands, of good, free soil, and good drainage, and an elevation ranging from one to two thousand feet. In such a locality and in a good cool soil, the possibility of splendid development in both tree and fruit is certain. The tree is a heavy feeder with a network of surface roots, and will show in a few months of growth, the benefit of artificial fertilization.

It may be accepted as a general principle that the selection of choice fruit from which to propagate is the right thing, but I can positively state that I have planted seeds from selected fruit, both as to size and quality, and the resulting tree, upon bearing, produced a fruit entirely different from the original. The tree itself is one of the easiest to propagate. The seed is exceedingly strong and will germinate in every instance, growing four or five inches in ten days if care is taken not to plant in soggy soil, nor to bury the seed too deeply—one inch of soil to cover being ample. Plant in boxes, prepare the soil with special reference to drainage, which can be readily effected by mixing soil with from one-eighth to one-quarter of seaside sand from which all saline substances have been removed.

When the plant, in the box, has attained the age of say six months as a minimum, the wood has sufficiently hardened to permit of transplanting. In this process care should be taken not to unnecessarily rupture the tender roots or to lacerate the stems. From this time on, to obtain the most speedy growth and early fruiting, in localities where drouth may be a hindrance to devel-

opment, irrigation at least once in ten days is imperative. The cultivator may have every reason to congratulate himself upon the vigorous growth and appearance of his trees, noticing with keen delight the first sign of blossoms. But a good many adverse conditions may arise between expectation and realization to lessen the measure of profit or enjoyment. When a young man I have seen in the northern section of Peru, in the Department of Cajamarca, on the Haciendas of several Peruvian landed gentry, large numbers of avocado pear trees, many exceeding in height any tree on the Island of Oahu, with trunks fully three feet in diameter, so that the fruit was beyond ordinary skill to gather, and the age of these trees, simply conjecture. I was then impressed, and the impression has ripened into conviction in the light of later observation, that those trees were so old as to warrant the belief that they were of indigenous growth, ante-dating the advent of the Spanish settlers.

This matter presents the same difficulty in its analysis as do all botanical subjects of the tropical zones, namely, the absence of systematic or scientific cultivation and of all data in relation thereto. Consequently, those of us whose habit is to experiment and investigate along scientific lines in such matters, will have to establish a starting point, so that those who succeed us may have available data, which we ourselves now lack. These ideas are suggested to my mind as an extenuation of the fact that in this, its adopted country, the plant itself is out of harmony with climatic conditions. We find it dissipating its vitality in a startling profusion of blossom and tender fruit which is blown from the stem—an infinitesimal proportion attaining perfection, and many trees producing no fruit whatever. Might not the inference prevail that the tree, though changing its habitat, has retained its inherent period of reproduction? Of these matters I am unable to satisfy myself, and am therefore unable to advise you. Now, as regards the fruit itself, there appears to be no doubt that it is highly esteemed by all dwellers in tropical countries, and I have reason to believe that in the present age in which we live, with the active, quick and increasing intercommunication between the peoples of the earth, matters which have been heretofore considered local are becoming of universal knowledge. Hence we find many of the most perishable fruits of the tropics are finding a market in the populous cities of the temperate zones. A gentleman who visited these Islands a few months since told me that

the avocado pear was being extensively cultivated in southern Florida, and that he had personal knowledge of the fact that New York fruit dealers have purchased entire crops, paying fifty cents for each fruit, and shipping them to New York in special cases, constructed on the plan of egg cases, where they found ready sale at one dollar per fruit.

Having given you not alone what information was available to me, but my own ideas and impressions on this subject, I feel that I have not only fallen far short of doing proper justice to it, but have perhaps wearied you with excessive detail.

Let us hope nevertheless, that from now on, every cultivator of the avocado pear in this Territory, will be sufficiently interested in the matter, to note and record every detail of his observations, such as best locality for planting, elevation, soil, moisture, wind protection, season of blossoming, yield, variety and quality of fruit.

SUGGESTIONS FOR MARKETING AVOCADO PEARS.

Sound "avocado pears" always meet with a ready market in San Francisco, and at good prices, at times ranging from \$2.00 to \$5.00 per dozen retail for good fruit. Occasionally there is a heavy drop owing to the arrival of over-ripe or badly packed fruit. In selecting avocado pears for distant markets see that they are as nearly full grown as possible, but hard. On no account should the fruit be plucked from the tree, but clipped with pruning shears, leaving but a very short portion of the stem—not over half an inch in length. On no account must any leaves be packed with the fruit, or the horticultural quarantine officers of the Pacific ports will demand the unpacking of such consignments, as occasionally a few scales are found on the foliage but not on the fruit. I do not anticipate any competition from Mexico, as all the avocado pears that reach California markets, are small, hard skinned, inferior fruit. The only country having fruit equal to the Hawaiian, that enters San Francisco, is Tahiti, but the great distance is against it. In packing use shallow boxes and wrap each fruit in wrapping paper, and ship in cold storage (not too cold), and orders should be given the consignee to have the fruit placed in a temperature the same as that in which it arrived and as soon thereafter as possible, and only withdraw enough to supply the im-

mediate demands of the market. In this way the prices will be more steady. Insist upon careful handling both in picking, packing and transportation.

ALEXANDER CRAW,
Supt. of Entomology and Inspector.

REPORT ON AVOCADO PEARS SHIPPED TO NEW YORK.

From Messrs. Lane & Son, New York, to the United States Agricultural Department at Washington.

"Mr. W. A. Taylor, Pomologist in charge of Field Investigations, Department of Agriculture, Washington, D. C.—Dear Sir: We beg to notify you that five crates of Avocado pears forwarded as per your instructions from Honolulu, were delivered to us by Mr. C. E. Thurston, representative of the Earl Fruit Company, of California, and upon examination we find the conditions as follows:

F 13 proved to be in very fine condition, there being eleven pears sound and in fine condition out of the thirteen that were originally packed in this box. These were very fair in size and such as our local fancy trade requires. We have sold these eleven pears for \$2.50.

E 15 was also in very fine condition, although not quite as good as F 13. In this crate there were seven sound pears, and the balance quite soft and unsalable.

D 24, in which the pears were packed in cells, nearly all show more or less defect, either from bruising in handling or due to the long time in transit. These seemed to be of the red variety of pears, although practically all of them turned brown or black, and in order to taste them we cut several and found them all showing the meat inside of a grayish color. These pears are quite small, and although for eating purposes may be as good as the larger ones, still the fancy trade who are willing to pay good prices for fancy stock will not buy these pears at any price.

This applies also to A. 36, which were practically in the same condition, most of which were lacking in firmness, and also showed the dark discolorations in the meaty part of the pear.

B 42 contained twenty-eight sound, good pears, and the balance soft and unsalable.

Regarding the discoloration of the meat, would say that two years ago we made some experiments here with Florida Avocado

pears in cold storage, being influenced to make these experiments by the fact that the Florida Avocado comes into the market during the months of July and August, and the early part of September, when practically all the wealthy class, who are expected to buy this product and pay a good price for it, are out of town, either at the seashore or other summer resorts. For this reason the demand during the months of July and August is very limited, and local dealers will not buy them except in small quantities.

In an effort to carry over some of the finest specimens received at this time until the trade returned to the city, we put a number of crates into one of the most modern cold storage houses in our city. Later on, when the demand improved, we drew out our supply from the storehouse, as the trade warranted our doing so, and although a great many of them had become soft and worthless, still quite a few were kept in apparently good condition, remaining hard and green.

We found, however, that in cutting several pears, the same conditions prevailed as with most of those received yesterday from Honolulu; that is, the meaty part of the pear had turned a dark gray, in many cases almost black, after remaining in the prevailing warm temperature for a few hours, become soft and entirely unfit to eat.

Since the experience in question we have come to the conclusion that it is impossible to keep an Avocado even in cold storage after a certain length of time (generally about ten days) without impairing its flavor and eating quality.

We found also that a good deal depended upon the condition of the pears when they were put into cold storage as to whether they would keep or not.

Such as we receive from Florida all reach us by All Rail Express, but even by shipping via express it is often the case that from the excessive heat of midsummer and being confined in a tight car, pears reach us more or less heated, and these even though perfectly sound and hard cannot be kept any reasonable length of time even in refrigeration. Once they have become warm through they will go on ripening the same, no matter what the temperature. On the other hand, if they are cool and well ventilated in transit, it is possible to keep them much longer, about ten days or two weeks under refrigeration, and not impair their flavor in the least.

As aforesaid, however, we do not think it possible to keep them

much longer than this time, as we have found that it does not only discolor the meat, but injures the flavor and eating quality very much, so that experts would prefer not to have any rather than buy this kind.—*From the Florida Agriculturist.*

*A PRELIMINARY ACCOUNT OF THE INSECTS OF
ECONOMIC IMPORTANCE IN THE HAWAIIAN
ISLANDS.*

BY F. W. TERRY.

Division of Entomology, Hawaiian Sugar Planters' Association.

(Continued from December Number, Vol. I, p. 352.)

(INJURIOUS) Continued.

Xystrocera globosa, Olivier.

This elegant beetle averages about one inch in length. ADULT.—Head and antennae reddish-brown. Antenna very long in the male, being nearly twice the length of the entire body. Thorax, sub-cylindrical, with a narrow steel-blue band along the anterior and posterior margins. Elytra flattened and narrow, ground color tawny, the outer margins having a narrow steel-blue band, from each shoulder and along the middle of each elytra runs a narrow steel-blue band which terminates just before reaching the elytral extremity. Legs, long, dark chestnut brown, the thighs (especially in the male) being broad and much flattened. This Cerambycid is frequently to be seen in Honolulu around fences and timber yards, one of the trees affected by its larva is the "Monkey-pod" *Albizia saman*). It appears to be a fairly recent introduction to these islands.

Prosopus Bankii, Fabr.

This Cerambycid is common in the valleys and gardens around Honolulu. It appears to have a wide distribution throughout the tropical and sub-tropical regions.

ADULT.—Length about $\frac{3}{4}$ inch. Head and antennae greyish buff, the latter about equal in length to the entire body in the female, much larger in the male. Thorax cylindrical, greyish buff. Elytra convex, fairly broad, greyish buff, with an oblique greyish patch about the lower half of each elytron. The whole area is

covered with minute bare black areas, giving the whole body surface a general appearance of grey pepper. Legs, greyish buff, moderately long.

LARVA.—The greyish or creamy-white legless, wrinkled grubs are frequently to be found boring into numerous dead or dying shrubs and trees—*Ricinus*, *Algaroba*, etc., and is also reported from diseased cane.

***Ceresium simplex*, Gyll.**

This small Cerambycid is frequently found attracted to light in Honolulu, etc. It is widely distributed throughout the Pacific groups.

ADULT.—Length about $\frac{1}{2}$ inch. Head and antennae light brown, eyes black, antennae about equal in length to the entire body in the female; larger in the male. Thorax cylindrical, somewhat swollen or globose, light brown, sparsely covered with short, fine whitish hairs. Elytra long, narrow, light brown, sparsely covered with short, fine whitish hairs. Legs fairly long, thighs much swollen, light brown.

LARVA.—A creamy-white, wrinkled footless grub, found boring into *Prosopis*, *Algaroba* and other Leguminosæ.

***Curtomerus pilicornis*, Fabr.**

ADULT.—This little Cerambycid to the casual observer closely resembles the above mentioned *Ceresium*. The thorax is, however, broader and the general coloring brighter and of a golden brown. It is frequently to be observed attracted to light. It appears to have a wide distribution, evidently owing to the exportation of its food timber, being recorded from S. America, W. Indies, Florida and England.

LARVA.—The larva is reported to attack *Eucalyptus* and *Ohia*.

In addition to the above common Cerambycids, there are also some which are rarer, also introduced at various periods in imported timber and plants. Besides these are a number of purely native species, occurring with extremely rare exceptions only in the native forests. Many of these are of very peculiar appearance, e. g. *Plagithmysus*; possessing very narrow and pointed elytra, the abdomen often protruding beyond them. The legs are long and the thighs (femora), (especially those of the males) being remarkably swollen; this character coexisting with the very long

hind legs, gives to these insects a considerable resemblance to grasshoppers. Upon showing specimens to some natives, they immediately exclaimed: "Ouhini" (grasshoppers). The coloring of this interesting group is not brilliant, but extremely elegant and distinctive; the ground-color being usually reddish brown or tawny, with black areas and patches of white, yellow, grey or black hairs, distributed in well-defined patterns. The most generally affected tree appears to be "Koa" (*Acacia koa*), the larva boring some little distance beneath the bark. Other trees recorded are "Mamane" (*Sopohora chrysophylla*), "Ohia lehua" (*Metrosideros polymorpha*), "Akahea" (*Bobea sp.*), "Wauke" (*Broussonetia papyrifera*), "Mamake" (*Piptu albidus*), "Opuhe" (*Urera sandwicensis*), "Ohia-ha" (*Eugenia sandwicensis*), "Naeo" (*Myoporum sandwicense*), etc.¹ Two other native Cerambycids, owing to their size and economic importance, deserve mention.

Aegosoma reflexum, Karsch.

ADULT.—This is practically the largest beetle occurring on these islands; in general appearance it resembles the above-mentioned *Xystrocera*. In size it varies considerably, like all wood-feeding insects, averaging about $1\frac{3}{4}$ inches in length. Head and antennae dark brown, the eyes large and prominent, antennae in length about equal to the entire body in the female, nearly double in the male. Thorax dark brown, sub-cylindrical, narrow anteriorly, widening posteriorly, with distinct lateral angles. Elytra long and narrow, dark brown, with raised ridges running parallel; the whole texture leathery. Legs long, dark brown, the thighs not dilated.

LARVA.—The larva has the characteristic appearance of all this family, being a wrinkled cream-colored grub, with a flattened brown head and very powerful mandibles. Large individuals will reach nearly three inches in length and a thickness equal to half an inch. Although this insect generally restricts itself to the native woods, it is reported to have been found boring cane at Spreckelsville a few years ago.²

It is still found sporadically attacking cane, but fortunately has so far not been recorded as doing much damage.

1. Fauna Hawaiiensis, Vol. II, part III, pp. 98-113.

2. Rep. Minister of the Interior, 1897, p. 129.

Parandra puncticeps, Sharp.

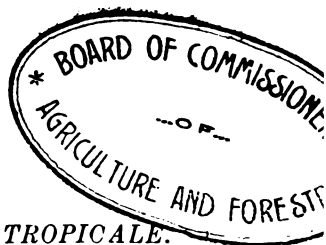
This beetle is very unlike the usual Cerambycid type, bearing a much more general resemblance to some members of another family of beetles (*Lucanidae*).

ADULT.—A large, stoutly built insect, varying considerably in size, usually about $1\frac{1}{2}$ inches in length, uniform in coloring, a dark chestnut, sometimes nearly black, the whole body surface destitute of hairs and possessing a very highly polished surface. Head large, flattened, with strong, well-developed jaws, sometimes very large in well-developed males. Antennae relatively short and thread-like; thorax broad and flattened. Elytra fairly broad, quite destitute of any markings. Legs rather short and stoutly built.

LARVA.—Usually a very large, whitish-yellow, wrinkled grub, with six very minute legs. Found boring into "Koa," making tunnels large enough to admit one's finger. It appears to be pretty generally distributed throughout these islands, and is probably commoner than would appear, owing to the nocturnal habits of the adult insects.³

3. Fauna Hawaiiensis, Vol. II, pt. 3, p. 95.

(To be continued.)



LE JOURNAL D' AGRICULTURE TROPICALE.

The January number of the *Journal d'Agriculture Tropicale*, Paris, is replete with a number of valuable papers, most of which are of interest to Hawaiian agriculture. Among the most important are the following:

"La Fermentation du Tabac, 2e article" by M. C. Delacroix.

"Les Fluctuations du Sisal depuis 25 ans."

"Le Bananier Massao dans le Bas Parana" by M. L. Paszkiewicz.

"Sur les Castilleja du Costa-Rica" by M. H. Pittier de Fabrega.

"Sur le *Cyperus rotundus* et sa destruction." (N. B.: *Cyperus rotundus* is our nut-grass).

"Sucre de Canne et sous-produits" by M. George de Préaudet.

A HAWAIIAN MILK AND BUTTER RECORD.

JERSEY COW, "PUA ILIMA."

(Dairy Herd Number, No. 6.)

Color Solid, Dark Nose, Tongue and Switch. Average weight about 900 lbs.

Property of Kamehameha Schools
Kalihi, Oahu, T. H.



1902-'03 RECORD:

Lactation Period365 Days
(Freshened April 12, 1902.)

Milk (average richness 5.1 per cent. Fat) 8843 lbs.

Butter (85 per cent. Fat equivalent) 624 lbs.

The above dairy record presented before the recent Farmers' Institute meeting, held at Kamehameha Schools, Feb. 4th, 1905, in a paper on "Some Modern Dairy Farms," has occasioned much interest because of its authenticity and its operation within our midst. It strikingly illustrates the influence of heredity, feed and care on the individuality of the high-type dairy cow, and is suggestive of the fine possibilities in dairying under Hawaiian conditions.

Fuller particulars having been requested to present to the readers of The Hawaiian Forester and Agriculturist, detailed data are given below:

The full-blood Jersey cow "Pua Ilima," (Dairy Herd number No. 6.) which leads the Kamehameha School dairy herd, is an ideal type of the single purpose dairy cow. Bred in California by a noted Jersey breeder, she possesses the characteristics of her breed to a high degree. (Note her form, especially depth of body, well cut up flanks, and rise of spire in the pelvic region, and general feminine appearance. Picture herewith was taken in 1904, at the end of her lactation period.)

At the time the above record was made she was six years old, freshening with her fourth calf, April 12th, 1902. In the prime of life, at the opening of a favorable season, much was expected from her, and our expectations were fully realized.

On the 18th of April, six days after calving, we began our record, measuring each milking and testing for fat by the Babcock method one or more times monthly. Monthly statement of yields and tests follow:

No. of Days.	Dates.	Total lbs. Milk.	Daily Average lbs.	Fat Test.
	1902			
13	April ..	422.9	32.53	5.4
	18-30 inc.			
31	May ..	1077.4	34.75	5.2
30	June ..	977.7	32.59	4.8
31	July ..	889.4	28.69	5.1
31	Aug. ..	806.0	26.00	5.0
30	Sept. ..	727.0	24.23	5.2
31	Oct. ..	676.3	21.81	4.9
30	Nov. ..	652.9	21.76	5.1
31	Dec. ..	628.9	20.28	5.0
	1903.			
31	Jan. ..	605.5	19.53	5.2
28	Feb. ..	554.8	19.81	5.3
31	Mar. ..	541.7	17.47	5.1
	Apr.			
17	1-17 inc.	282.8	16.63	5.2
365		884.3	24.31	5.1

The highest yield for one day was 35.51 lbs., (not quite 17 quarts) and tested 5.4% fat. The remarkable evenness of her milking is apparent from the above table, and the slow, gradual dropping off of yield quite remarkable. An idea of the persistency of her milk flow is obtained when it is stated that at the time of again calving (August 15th following) seventeen months after

the previous freshening she was still averaging about 10 pounds daily—a tremendous but unavoidable strain, as it seemed impossible to dry her off.

The following daily ration, divided into an equal morning and evening feed was approximately fed throughout the record period:

Forty to fifty pounds chopped sorghum, sweet corn, Kaffir corn, milo maize, cow pea, para grass (*Panicum mollis*), sweet potato tops, hona hona (a variety of *Tradescantia*) and manienie grass (*Cynodon dactylon*), separate or mixed in various proportions, formed the green fodder ration.

3 pounds wheat bran.

2 pounds middlings or shorts.

2 pounds linseed or cocoanut meal.

5 pounds algaroba pods (*Prosopis juliflora*) made up the concentrates.

The above ration gives a nutritive ratio of 1:6.5, and its cost is 18 cents to 20 cents per day.

In addition to the above ration, which is fed at time of milking, cows have free run of Bermuda hill pasture, which is quite dry during larger part of the year.

All dairy work is performed by student labor under careful supervision. Punctuality in milking and feeding is insisted upon, and our students receive a valuable training in good habits as well as in this important branch of agriculture.

F. G. KRAUSS,
Agriculturist, Kamehameha Schools.

A PARTIAL ACCOUNT OF INSECTS AFFECTING TOBACCO IN HAWAII.

BY D. L. VAN DINE,

Entomologist, United States Experiment Station, Honolulu.

(Continued from February Number, p. 31.)

THE TOBACCO SPLIT-WORM.

(The larva of *Phthorimaca operculella*=*Lita solanella*, *Gelechia solanella*, *G. operculella*, etc.)

(Order, *Lepidoptera*. Sub-order, *Heterocera* or moths. Family, *Gelechiidae*.)

The tobacco split-worm or leaf-miner is the well-known "potato-tuber moth" of California, the Mediterranean countries, New

Zealand and Australia. A stem of a tobacco plant infested with a single specimen of the larva of this insect was received from the Hamakua experimental field (Pohakea, Hawaii,) the latter part of February, 1904. The adult moth was bred and forwarded to the U. S. Bureau of Entomology for identification. The determination was kindly made by Mr. August Busck. During the past season the injury of this pest to the tobacco plants has been reported as quite considerable and the split-worm promises to be one of the most serious pests that will affect the tobacco plant in Hawaii. The insect was probably introduced into the Islands in potatoes from California, although it may have arrived in the stewards' supplies from either Australia or China. It was first recorded as a tobacco pest on the mainland in 1897, by Mr. Gerald MacCarthy.¹

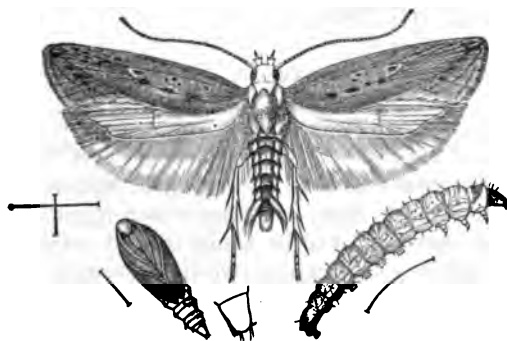


Fig. 3. The tobacco split-worm, *Phthorimaea operculella*. Moth shown above; "split-worm" or larva below at right; pupa below at left. All enlarged; natural size shown by hair lines. (From Howard.)

The small size of the larva will render its presence difficult of detection, at least in the early stages of development. The occurrence of the split-worm in the tobacco field will probably be first noticed by the symptoms of its work. This insect receives its common name, split - worm or leaf-

miner, because of its habit of mining between the upper and lower surfaces of the leaf, causing not only a blotch visible from either side, but frequently a deformity as well. The portions of the leaves thus affected become at first lighter in color and finally dry and parchment-like. While the parts of the leaves remain intact, their value is greatly lessened, especially for wrapper purposes.

The eggs are deposited on the leaves and the young minute larvae, on hatching, bore at once to the tissues between the epidermal layers. On reaching maturity the larvae drop to the

1. A New Tobacco Pest. Bul. 141, North Carolina Experiment Station.

ground, and after first spinning a slight silken cocoon, pupate beneath the loose soil or among the rubbish found at the surface. Mr. Warren T. Clark¹ sums up the life-cycle of this insect as follows:

To complete the cycle ordinarily, 63 to 69 days are needed, save for the winter generation, when this time may be extended to 84 or 85 days; this, of course, under the temperature conditions of Berkeley. This time is divided thus: Egg stage, 7 to 10 days; larvae, 42 to 45 days ordinarily, winter generation 9 weeks; chrysalis (pupae), 14 to 16 days; adult life, indefinite, but short.

In the equable climate of these Islands the life-cycle is undoubtedly shorter than this, and at least two generations are possible during the growth of one crop.

REMEDIES.

Under this heading Mr. MacCarthy says:

Clean cultivation of the growing crop, with frequent stirring of the soil close up to the plants, will destroy the dormant pupae or cover them so deep that the moth will be unable to find its way to the surface of the ground. A close watch should be kept, and when blotch mines are seen on leaves the enclosed caterpillar may be easily crushed between the thumb and finger. The leaves will then soon repair the damage.

It would seem that this pest, feeding as it does within the leaf, is not susceptible to treatment with poisons placed on the surface.

This would be true were it not for the habit of the larva to migrate from place to place as pointed out by Mr. Quaintance. He says:

In feeding, a larva does not pass its entire life at one place, but after eating for awhile, it will chew to the outside, and after crawling around over the leaf, will finally enter the tissue again in a new place. A knowledge of this migratory habit is possibly of value, as it suggests a means for treating this insect, in that it must chew the outside of the leaf to some extent in leaving and entering the leaf, and hence might be poisoned. As a rule, the lower five or six leaves are infested worse than those higher up on the plant.

From the above it is evident that an arsenical spray, such as the Paris green mixture recommended for the flea-beetle, will also

1. The Potato-Worm in California. Bul. 135. California Experiment Station. 1901.

be effective for the split-worm. It is well, however, to again emphasize cultural methods and preventive measures. For example, if the plants are sprayed before the eggs hatch, the very young larvae will be killed in attempting to gnaw through the surface of the leaves. All solonaceous weeds about the field should be destroyed as well as badly "blotched" leaves and infested stalks. After harvesting the crop, all stalks, stumps and rubbish should be collected and burned, since many of the larvae and pupae, and possibly hibernating moths, will be destroyed, which will greatly reduce the numbers of the pest likely to attack the following crop.

(To be continued.)

THE VEGETABLE GARDEN.

By F. G. Krauss.

March.

The unusual drought during February has not been without its lessons. It has forcibly demonstrated the value of deep plowing as assisting the percolation of irrigation water and enlarging the water holding capacity of the soil reservoir, especially in soils of a heavy compacted nature. Frequent surface tillage has helped to conserve this moisture by the formation of an "earth mulch" in destroying surface capillarity and thus reducing evaporation to a minimum. We have reduced the frequency and amount of irrigation fully one-half by frequently stirring the surface soil, using a deep, narrow-bladed hoe and fine-toothed rakes on beds; and a five-tooth "Planet, Jr.," one-horse cultivator in field culture, followed by an "Iron Age," thirteen diamond-tooth, one-horse harrow. Both the above implements have adjustable frames, permitting their use between rows twelve or more inches apart. With a good steady horse and an experienced man, these implements are indispensable for the garden, farm and orchard. They permit the handling of large areas in the shortest possible time, and do the work better than can be done with hand tools, with a great saving of labor.

IRRIGATION.

"An aid to Nature."

Under the semi-arid conditions of our leeward districts, without a permanent supply of ground-water to be made

available by tillage, irrigation has been made profitable even during seasons of normal rainfall,—but with the total absence of rain during the past month, it has become absolutely necessary to irrigate even well-established, deep-rooted plants, and we are forcibly reminded that an adequate water supply is necessary if we would succeed in vegetable growing.

Irrigation is an expensive item and many methods have been devised for the storage and application of irrigation water. Where a perennial stream or spring, at sufficient elevation, is available, the problem is easily solved, but when pumping and the construction of reservoirs, or the damming of streams becomes necessary, it is advisable to consult an expert, or person experienced in such matters. The character of the soil and crop must largely determine the method of applying the water. On light, porous soils, flooding moistens the soil most uniformly, and is best done by raising low banks around the plots, which must, of course, be perfectly level to distribute the water. After flooding, and as soon as the soil is sufficiently dry, tillage is essential to prevent baking; or if the crop be sown broadcast, as is often done with the radish and other small root crops or grasses and clovers, a light straw mulch may be spread over the seed bed and effectively prevent a too hasty drying out, with its consequent baking and cracking, which is so disastrous to tender young plants.

Raised beds are the reverse of the check system in that the water is allowed to flow in the dividing ditches and percolation takes place laterally, producing a semi-sub-irrigation, though the narrowness of the beds in this system permits of spraying the plants overhead by dashing the water from the ditch with a broad flat scoop. The surface soil is less liable to become puddled by this system, which is largely practiced by the Italian vegetable growers in California.

Permanent ditches drawn close to contour lines are well adapted to sloping lands and serve a further useful purpose in checking the wash of hillsides during heavy rains. Placed as nearly parallel as possible, such ditches are spaced at distances that will permit of the seepage water reaching throughout the intervening space. After traversing back and forth until the area is sufficiently moistened, or it may flow continuously, the surplus may be utilized by flooding meadows, etc., on the lowlands.

On lowlands, irrigation by seepage from permanent ditches.

which may be dammed at any desired height to elevate the water accordingly, is much practised on the reclaimed lands of California. Such ditches may also be made to serve as drainage.

Our system of irrigation at Kamehameha is by simple furrow distribution, for all except the small and more delicate vegetables. This plan is found most economical of water and labor, and permits of horse cultivation after each irrigation. We lay out rows to be planted by furrowing with a 12-inch plow, and when the ground is very dry we give a preliminary irrigation by turning water into each furrow. This fills the bottom of the furrow with sediment, and carries the water to a greater depth than could very well be done after the seed is sown. A day or two later the cultivator is adjusted to its narrowest width and run in the furrow, leaving a perfect seed bed—moist and mellow; seeding follows immediately and further irrigation and cultivation are not necessary until the young plants are well established. Subsequent irrigation, followed by the customary cultivation and harrowing, gradually fills in the furrows and thereby hills the soil about the plants with beneficial results. By this method, three irrigations have sufficed to bring crops of corn, beans, etc., to the edible stage from the time of sowing the seed.

Theoretically, sub-irrigation by tile or pipes is an ideal method of distributing water to garden plants, but no practical method seems as yet to have been devised satisfactory for use on a large scale. Surface sprinkling is extravagant and lacks in thoroughness, in that the water so applied fails to penetrate deeply and puddles the surface. The importance of an adequate water supply can be better appreciated when it is known that it requires from 350 to 500 pounds of water for every pound of dry vegetable matter produced.

A continuation of brief cultural directions of the alphabetic list of vegetables follows. It has been suggested that the botanical name of genus and species, in addition to the common name of vegetables, would make these garden notes more complete; and to this, the writer has thought the further addition of the French, German, and Portuguese names might prove helpful to foreign readers.

Commencing with this number, the botanical name will follow the common name, and underneath, the French, German and Portuguese names, prefixed by the abbreviations, F. G. and P., respectively.

At the end of this paper will be found the above data, covering varieties from which it has been omitted.

BEETS. *Beta vulgaris*.

F. *Betterave*. C. *Rothc-rube, salat-rube, runkel-rube*. P. *Betarava*.¹

Garden beets for table use are among the easiest grown vegetables and may be harvested every day in the year. Quick growth ensures tender roots, and for this a rich mellow soil is essential, but an excess of organic matter in the soil tends to cause scabby roots, where a smooth skin is desirable. Sow the previously soaked seed in drills two inches deep and from 10 to 14 inches apart for hand hoeing, and 18 inches apart for wheel or horse hoes. One ounce of seed will sow 50 feet of drill, and five or six pounds are required for an acre. When three inches high thin the plants to five inches apart. The "thinnings" make excellent greens. For a succession, seed may be sown every two or three weeks.

Field beets, Mangel-wurzels, Tankard-mangels, etc., are highly prized in Europe and America for stock feeding, and under favorable conditions are heavy yielders. They are worthy of trial in this country; a deep mellow soil should be selected and the seed sown early in the spring. Moisture and cultivation largely determine the yield.

THE CABBAGE FAMILY.

COMMON CABBAGE. *Brassica oleracea capitata*.

F. *Chou cabus, chou pomme*. G. *Kopfkohl, kraut*. P. *Couve repollo*.

SAVOY CABBAGE. *Brassica oleracea bullata*.

F. *Chou de Milan*. G. *Savoyerkohl*. P. *Saboia*.

BRUSSELS SPROUTS. *Brassica oleracea bullata*.

F. *Chou de Bruxelles*; G. *Brusseler sprossen-zwirsing*; ITAL. *Carolo a germoglio*.

CAULIFLOWER. *Brassica oleracea botrytis*.

F. *Chou-fleur*; G. *Blumen-kohl*; P. *Couve-fior*.

1. The writer is largely indebted to Wickson's most valuable work "California vegetables," for the foreign names and other data.

BROCCOLI. *Brassica oleracea botrytis*.

F. *Choux brocolis*, *chou-eur d'hiver*; G. *Spargelkohl*; ITAL. *Cavolo broccolo*.

BORECOLE OR KAIE. *Brassica oleracea acephala*.

F. *Choux verts*; G. *winterkohl*, *brun kohl*, *grun kohl*; ITAL. *Cavolo verde*.

(Note.—Kohl-rabi and Ruta бага, species of brassica bearing fleshy stems, will receive subsequent attention.)

The same general principles underlie the growing of all the cabbage tribe, and the general directions that follow will apply to the genus *Brassica* as a whole:

Bred to a high state of perfection by years of careful selection, no vegetable responds to intelligent, intensive culture better than this class of vegetables, and none deteriorates so quickly under neglect and adverse conditions. Cabbages are made to thrive upon a great variety of soils, from a heavy clay to a light, sandy loam, provided the soil is heavily enriched and in good tilth. Deep plowing and heavy manuring are very essential for this crop, and application of 40 tons of good farm compost per acre is not an uncommon practice among truckers who make a specialty of this crop. The following chemical fertilizer applied at the rate of 1,500 pounds per acre, is also recommended:

Ammonia, 6 per cent.

Available phos. acid 5 per cent.

Potash 7 per cent.

Wood ashes at the rate of one ton per acre is found very beneficial.

In a carefully prepared, but not overly enriched, seed bed, from which the young plants are to be transplanted later, make drills one inch deep and six inches apart across the bed, which should not exceed four feet in width, using a board as a straightedge; sow the seeds thinly, three to five to the inch, cover half an inch, firmly with a board, and wet thoroughly. Such a procedure is applicable to the sowing of all seeds, seedlings of which are to be transplanted later, except that the smaller the seed the less deeply they should be covered—five times the narrowest diameter of the seed is a safe rule to cover.

From the plantlets' first appearance above ground, until the perfect head is formed nothing should check the growth. Vigilance must be the watchword. Careful watering, thinning out the weakest plants to three or four inches apart, weeding and stirring the soil, and lastly, guarding against insect attacks, form the secret of producing sturdy young plants for transplanting, and upon these largely depends the future crop. Transplanting should be done when the plants are about four inches high. Select a cloudy day, if possible, and with a trowel remove the plants from the seed-bed with as little injury to the delicate rootlets as possible. A previous watering will aid in holding the soil together, but excessive moisture will ball up the roots. A wet sack covering the dug plants, will prevent a too rapid drying out before they are reset in permanent rows.

When ready to transplant, furrow out the previously well-prepared field, allowing from two and a half to three feet between each furrow. If very dry it will be advisable to turn the water into the furrows and when sufficiently drained set the young plants fifteen to eighteen inches apart in the row, using a dibble to make the holes and to firm the soil around the roots. Cutting back the outer leaves at time of setting lessens the exhalation of moisture naturally contained in the plant, and thereby prevents wilting, which is sure to produce a check, however slight.

In this connection it may be of interest to state that Hales, the earliest observer of the phenomena of the transpiration of water through plants, found that a cabbage plant whose leaf surface equalled fifteen to twenty square feet, exhaled in 24 hours about three pounds of water. As this moisture must be absorbed by the roots, the importance of reducing evaporation to the minimum until the plant has become firmly established, will be appreciated. As the plants develop constant cultivation and an ample supply of moisture will be essential to unchecked growth and perfect development. Early varieties, such as the Early Jersey Wakefield, will begin to head in seventy days, and are ready for harvest in one hundred days with us under favorable conditions. Late varieties will require fifty to eighty days longer to mature, according to circumstances. Other things being equal, light soils should be selected for early quick maturing varieties, and heavy soils for late, slow-maturing kinds.

Much space has been devoted to this vegetable because it is believed that the entire large California importations can, and

ought to be, replaced by home production. The writer has seen as fine cabbages from Wahiawa, Oahu, as can be grown anywhere—quantity and regular successions only have been lacking.

Brussels Sprouts require the same conditions as cabbage, but mature more slowly, since the “sprouts” are borne at the base of the larger leaf stems. Breaking the leaves seems often to encourage the development of sprouts. In harvesting do not break off, but cut from the main stem with a sharp knife, leaving a short spur with bud to induce the formation of successive sprouts.

Cauliflower is even more exacting in its requirements than cabbage; the same cultural directions should not only be followed but intensified. New soil should each year be selected for this crop, which precaution indeed is important for the whole cabbage family. An additional aid to the production of stocky plants is to prick out into another bed or shallow boxes the tiny four or five-days old plantlets. When these show the third pair of leaves, prick out again, setting them three by three or four inches apart. This frequent transplanting before setting out permanently develops a large mass of firm fibrous roots, which are the true feeders and mainstay of the plant, and though a tedious procedure it pays in the end.

Broccoli is similar to cauliflower, though less desirable, as it possesses a smaller and coarser head. We have not succeeded in heading it.

Borecole or *Kale* designates the non-heading cabbages. They do well with us and are easily grown. The young tender shoots make good greens and are highly prized by the Germans. There are a large number of varieties, but we have only grown the Dwarf Green Curled, a standard sort.

The tall Jersey Kale, or Tree Cabbage, is largely grown in California for chicken greens, but we have been unable to obtain fertile seed.

(The following foreign names were omitted from varieties of vegetables considered in preceding chapters):

ASPARAGUS. *Asparagus officinalis*.

F. *Asperge*; G. *Spargel*; P. *Espargo*.

ARTICHOKE, JERUSALEM. *Helianthus tuberosus*.

F. *Artichaut*; G. *Artischoke*; P. *Alachofra*.

ARTICHOKE, JERUSALEM. *Helianthus tuberosus*.
F. *Topinambour*; G. *Erdaßfel*; P. *Topinambor*.

BEANS.

BROAD BEANS. *Faba vulgaris*.
F. *Feve*; G. *Garten-bohnen*; P. *Fava*.

KIDNEY BEAN. *Phaseolus vulgaris*.
F. *Haricot*; G. *Bohne*; P. *Feijao*.

SCARLET RUNNER. *Phaseolus multiflorus*.
F. *Haricot d'Espagne*; G. *Arabische bohne*; ITAL. *Fagino do ai Spagna*.

LIMA BEAN. *Phaseolus limatus*.
F. *Haricot de Lima*; G. *Breitshottige Lima bohne*; ITAL. *Faginola di Lima*.

Black-eyed Bean and the Asparagus Bean—*Dolichos* sp.

FRUITS SUITED TO CULTIVATION IN HAWAII.

No. II. The Carambola or Blimbing.

The above names appear to be used indefinitely for the fruit of the nearly allied species *Averrhoa Bilimbi* and *A. Carambola*, but it is to the latter that attention is here directed. The former, or Blimbing proper, is extensively cultivated in China, where it is in great request for curries and such dishes, but its intense acid nature would probably not recommend it to popular use in Honolulu. The Carambola, whose remarkable five-lobed yellow fruit makes it a conspicuous object in many Chinese stores in this city, finds here a ready sale, not only to Orientals, but to those white residents who know its value. Two varieties of the Carambola are met with, the "sweet" and the "sour," both of which abound in a quantity of refreshing juice, similar in use and most other respects except that of flavor, to the lemon. The beautiful wax-like golden fruit of the "sweet" Carambola is more attractive to the eye than the green and less transparent "sour" variety. Each kind is of value for the manufacture of refreshing summer drinks, and for jellies and preserves, but the "sweet" variety is to be prefer-

red. Like the lemon, these fruits, on account of their acidity, are unsuited for using uncooked except in the form of a beverage.

The Carambola has already shown its ability to flourish in Honolulu: one tree in particular has lately yielded a crop of some 2400 mature fruit, and after a few months is again in bloom. The tree grows readily from seed, though the latter are not always developed, but they may generally be found in sufficient quantities by holding the semi-transparent fruit to the light. From 12 to 18 feet is the usual height attained by the trees, which possess an attractive spreading head and sensitive leaves. Fruit is generally produced after three years, and crops are yielded two or three times a year for many years. The usual price of the Carambola in Honolulu is one cent each, which, taking the tree already mentioned, gives a retail value of \$24 per crop, valued at wholesale at perhaps \$8. Two crops a year would give the annual income from each tree at \$16, and as each occupies but little space, the return from an acre is by no means small. There is no doubt that all the Carambolas eaten in these Islands could be produced in the gardens of Honolulu, and the demand might easily be multiplied.

HAWAIIAN ENTOMOLOGICAL SOCIETY.

The second regular meeting of The Hawaiian Entomological Society was held in the Library of the Bureau of Agriculture and Forestry, on February 9th, 1905. The following were present: Messrs. Perkins (in the chair), Terry, Van Dine, Hosmer, Craw, Giffard, Eckart, and Kotinsky. After reading the minutes, the secretary read a communication from Mr. Kirkaldy, which was voted to be placed on file. Upon motion of Mr. Giffard, Brother Matthias Newell of Hilo was elected to honorary membership in the Society.

Mr. Kotinsky then read the prepared portion of his "History of Economic Entomology in Hawaii," the whole of which will be published elsewhere. This was followed by an interesting description of "Entomological and other Notes on a Trip to Australia," by Mr. R. C. L. Perkins. Both papers were thoroughly discussed by all present. After some notes, with exhibition of

specimens, presented by Messrs. Terry and Kotinsky, the So adjourned.

The third regular meeting of the Society was held in the library room of the Bureau of Agriculture and Forestry, March 9, 1905, with Mr. Craw in the chair, and six others present. Miss Melika Peterson, Dr. N. A. Cobb, and Mr. Gerrit P. Wilder were elected to active membership. The paper on the program, "History of Economic Entomology in Hawaii" was then read. At the request of the chair, Mr. Kotinsky read the entire paper, including the portion presented at the last meeting. Mr. Terry exhibited a box containing representatives of all the species of butterflies on Hawaii. The only native species there (*Pyramis tammeamea*) received most attention; there were nine species altogether. Mr. Kirkaldy exhibited three antiquated volumes on entomology. One of these is perhaps the oldest purely entomological work known; it was published in London in 1634. The excellent appearance of the print and cuts elicited general admiration for the quality of paper then used. On the authority of Dr. Cobb, our modern half-tone paper will not last over fifty years. The season question on Hawaii was then raised by Mr. Kotinsky, and brought forth interesting data, from which it was gathered that the present month corresponds to May and June of more northern climates. This, Mr. Bryan demonstrated by finding March to be the height of the nesting season of Hawaiian birds. Mr. Kotinsky was satisfied in this respect by finding the Koa in blossom, the tammeamea butterfly in abundance and mating, and Koa borers ovipositing during this month. Several other biological problems were discussed before the hour of adjournment at 10 a. m.

JACOB KOTINSKY,
Secretary-Treasurer.

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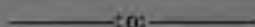
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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 4

The depression of the local rice industry, in consequence of the preference of our Japanese for their home grown produce, and also of the depreciation of market rates through competition with mainland growers, cannot be contemplated without regret. The peculiarities of Japanese rice, which render its purchase preferable by some to our local grain, are not such as to render it more acceptable to white consumers. Indeed the differences appear to be chiefly due, not so much to the inherent qualities of the two grains, as to a less extended process of milling followed in Japan. The sowing of Japanese rice, and the adoption of the Japanese method of milling by Hawaiian growers, would not unlikely produce an article indistinguishable from the Oriental product. The investigation of this subject is well worth the attention of our Chinese rice growers and of all owners of rice land. The protection of an established industry, upon which the welfare of a number of inhabitants depends, is certainly as worthy of our endeavor as the introduction of a new one. If experiments on the lines suggested were successful, not only would an old and picturesque employment be preserved, but amelioration would be given to a deserving class of industrious residents upon whom the stress of the last few years has fallen with particular severity.

In continuation of the suggestion, made last month, of a plan to enable visitors and others to identify out local flora, a preliminary step in this direction might be taken in the following manner: A tabulated list of the names (both common and scientific) of our most conspicuous trees and plants should be printed, and to each name a definite number appended, with which each particular species would, in this connection, always be associated. The most prominent specimens in the public parks and grounds of the city, should also have attached to them their individual number, corresponding to that in the published list. According to this method all the

trees of the same species, as, for instance, the Pride of India trees, would bear the same number, and persons interested in the subject would at once be able to determine the name of any specimen by reference to the list. Two columns of names would add little to the bulk of a pamphlet, but would include the majority of our interesting plants, and probably add more to the value of a publication as a book of reference than could be accomplished by any other means.

Mr. Gerrit Wilder's article on the Mangosteen, which appears in this number, is a valued addition to the series we are publishing on fruits which we hope to see established in the gardens and orchards of these Islands. The Mangosteen is well known to visitors of the East and is considered by many to be the most delicate and delicious of fruits. Although its introduction to other countries has not always been attended with success, Mr. Wilder's article shows that the conditions of certain localities in this Territory encourage the belief that perseverance will ensure its cultivation here.

In consequence of the pressure of other matter, a most interesting and important paper on the cultivation and grafting of Mangoes, written for the Forester by Mr. D. MacIntyre, has been omitted from this number. This article will appear in the May issue together with illustrations of experiments which have been conducted by the author in Moanalua Gardens.

A paper upon the cultivation of Vanilla has been received from Mr. E. H. Edwards, Napoopoo, Hawaii, and will be published in our pages at an early date.

FRUITS SUITED TO CULTIVATION IN HAWAII.

No. III. THE MANGOSTEEN. .

(Garcinia Mangostana.)

BY GERRIT WILDER.

This tree and its fruit was named after Monsieur Laurent Garcin, a French botanist and traveller of the 18th century.

This genus of tropical trees comprises about forty species, and belongs to the order of Guttiferæ. It is a native of the Malay Peninsula, and grows well in Ceylon and Trinidad, and in the Botanical Gardens at Jamaica—but not so successfully in India. Numberless efforts are said to have been made to naturalize this tree in the tropics, but without marked success. It needs a moist and fairly equable climate, with the temperature from about 72° to 76° Fahrenheit, and with a rainfall of about a hundred to a hundred and fifty inches yearly. It does not thrive so well on the open plains as it does in the sheltered valleys, with light shade.

In shape, the Mangosteen tree is symmetrical—its branches coming out in regular order, giving the tree the form of a parabola—the opposite, coriaceous leaves are elliptical and oblong—and about seven or eight inches in length. They are a beautiful shiny green on the upper side, and a light olive brown on the under side; one of the distinctive characteristics of the leaves of the true Mangosteen is the marginal line which runs the whole length of the blade, about a quarter of an inch from the edge; the regular veins coming from the mid-rib join this marginal line.

The flowers are usually solitary and terminal—are red in color and in form resemble the single wild rose. There are four roundish petals which are thick at the base and grow gradually thinner toward the margin.

The fruit is round, about two inches in diameter, and has a tough rind; it is first green, then gradually changes to pink, then finally to a rich deep purple when ripe; inside the fruit is divided into edible segments, white in color, and in shape and arrangements like those of the orange. These segments contain the seeds, which are dark brown and about the size of a small Lima bean.

The flavor of the fruit is said to suggest something between the grape and a peach, and the successful ripening under glass of this luscious fruit is considered a consummate achievement in the art of gardening.

The Mangosteen is of very slow growth but comes true to the seed, and it is said that ripened cuttings can be made to root and grow, if started under glass with strong bottom heat.

The first Mangosteen trees were sent here from the Far East, at the instigation of the late King Kalakaua, for during his trip around the world in 1881, 1882, he saw the fruit, and desired to establish the Mangosteen in the Islands; accordingly plants were forwarded here, and distributed by Mr. Jaeger, but with poor results. Out of this shipment but two trees survive that have borne fruit, one growing at "Kekopua," (planted by Mr. Aubrey Robinson), at the home of Mr. Francis Gay, Makaweli, Kauai. The other tree is at the residence of Mrs. Horner, Lahaina, Maui, and was planted by Mrs. Harry Turton. In February last when the fruit was ripe, I made a special trip to Lahaina to see it. This tree has a somewhat stunted appearance, having reached the height of only nine feet; its leaves are yellowish in color, quite thick, and until this year, when the tree bore fruit for the first time, it was thought to have been an Ohia (*Eugenia*). While there I made some grafts by approach, using the Kamani (*Chrysophyllum Innophyllum*) stock of two years growth. I hope to find on my next trip to Lahaina that I have been successful in at least one or two of these.

On March 21st, I made a trip to Kauai to see the Mangosteen tree growing in the garden of Mr. Francis Gay at "Kekopua." This tree is the same age as the one at Lahaina, although it shows having had better care, reaching the height of twelve feet.

The fruit at present is about half formed, and ripens in June and July. Now, the question naturally arises as to the reason why the fruit of the Lahaina tree ripens four months ahead of that of Kauai, when the elevation of both places is about the same, the soil and other conditions similar.

Mr. Jordan has imported a number of plants with poor results; he has one *Garcinia* growing at his residence in Nuuanu valley, supposed to be the Mangostana, but the foliage is not like the two already mentioned. In my garden here in Honolulu, I have trees a year old, which I brought with me from the Department of Agriculture at Washington; they have had the greatest care

and one of them seems to be thriving. In this shipment from the East made for the Hawaiian Government, Besides the *Garcinia Mangostana*, there were plants of the Gamboge, (*Garcinia Xanthrochymus*.) This tree thrives well in Honolulu and some of them have had fruit, notably at the residence of Mrs. Jaeger, Mrs. T. R. Foster, Mrs. Campbell Parker, at the Government Nursery, and at the Queen's Hospital. There are a number of trees bearing at the premises of Mr. Gay and Mr. Robinson of Kauai; this tree has been mistaken for the true Mangosteen, and is often erroneously called the African variety. The fruit is yellow in color, somewhat sour, and entirely different in shape to the Mangosteen.

I hope that a more extensive distribution of the *Garcinia Mangostana* will be made throughout the Islands, with the idea of ascertaining whether or not there are other localities besides Lahaina and Makaweli, where this tree and its wonderful fruit will thrive.

THE VEGETABLE GARDEN.

April.

The amateur gardener who has maintained thriving vegetable beds during the past months of drouth, has the best encouragement for the approaching summer months and is to be congratulated upon, either his favorable location, or exceptional skill in the care of plant-life,—the most successful have probably both these important factors to their credit.

Speaking for Kamehameha Schools' farm, the following vegetables have grown with varying success during March, and up to the present writing (April 15th):

Beans, Kam. Imp. Golden Wax, and Burpee's Bush Limas; the latter sent out for trial in the U. S. Congressional seed distribution, is an unusually strong grower and stands the dry weather well with the aid of frequent cultivation. Our limited water supply has principally been concentrated upon extensive plantings of sweet corn, for which we find this the best season. A Kamehameha selection of the California Mammoth sweet variety is the kind now exclusively grown by us, and is proving very satisfactory during present adverse conditions. Our squash have suffered from lack of water, and

while very productive owing to an almost total absence of the destructive melon-fly, the size averages considerably smaller than in past seasons. The old Hubbard variety is in the lead for size and vigor of growth, and Giant Summer Crook Neck, also sent out by the U. S. Dept. of Agriculture is a good second; the more refined Scalloped bush sorts have done poorly with us so far this season. Of the smaller vegetables, Table Beets,—Crosby's Egyptian, Crimson Globe and Cox's Imp. Blood Turnip,—are doing well; and also Guerande, Chantenay and Danver's Half Long Carrots; Egg Plant, Black Pekin, has never fruited better with us than now, even year old plants continue productive as the warm, dry weather appears especially favorable to them. Up to April 1st, Peas did well, contrary to expectations. It was plainly noticeable that the tall, dense growing varieties, Yorkshire Hero (also known as Alameda Sweet Pea), Champion of England, and Telephone, although late varieties, did much better than the extra early dwarf sorts such as American Wonder and McLean's Little Gem. Radishes, where planted close so as to well shade the ground are doing well. Lettuce and onions have shown the effects of the dry heat, though a passable product is regularly harvested. Cabbages, as might be expected are doing poorly out of season, this year especially, though we have harvested a few solid five and six pound heads; on the other hand, Collards and Kale are doing very well. Newly planted Sweet Potatoes are suffering, while well established Papaia's are in their element, some fifty odd ten months old trees are supplying us with two to three dozen fine fruits weekly.

All varieties of vegetables have been unusually free from insect pests thus far this season; however, some squash plants have been attacked by a wilt disease similar to that caused by the melon fungus so disastrous during some seasons. Spraying with Bordeaux mixture did not seem to check the disease on infested plants, which were uprooted and burned after eight days' unsuccessful treatment. After this time, only an occasional plant showed wilt and was as quickly destroyed. February sown beans showed some "pod spot" (anthracnose), but bore a fair crop of snap beans. Later sowings have been entirely free from either these diseases, which have not before been noticed at Kamehameha.

With the approach of summer and possible rains resulting in excessive humidity, the Aphis pest (plant lice), and other injurious insects and plant diseases may be expected to put in an appearance, and since to be forewarned is to be forearmed, a few simple preventatives and remedies as used with more or less success at Kamehameha farm may be helpful.

INSECT ENEMIES.

"Eternal Vigilance—the Price of Success."

It may with truth be affirmed that no single phase of work pertaining to gardening has received more serious study and been given wider publicity than the subject of combatting insect pests; yet none causes the average gardener more annoyance and loss than the tiny enemies who, like the poor, are always with us. Nothing exists without a reason and the writer's private belief is that insect pests were especially created to cull-out half-hearted and inferior agriculturists. He has yet to find a case in his own experience in which insects got the upper hand where prompt energetic action on his part would not have won the day, and he would instil into every gardener the importance of "eternal vigilance." Do not wait until your plants show injurious effects, but look over—and under—they daily, for, while it may be a simple matter to overcome the first attack, it more often becomes impossible to dislodge the enemy when once well established—at least with any hope of saving the crop.

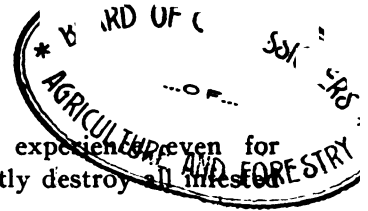
The most effective and satisfactory measures of combatting injurious insects are those of a preventative character, and first among these is our best effort to maintain a vigorous and continuous growth through frequent cultivation, which at the same time insures clean fields that will not harbor pests, as weed patches too often do. Next to preventatives comes a judicious system of rotation. In a country of so mild a climate as Hawaii, insects are not winter killed and permanent breeding places are established. The observant gardener will note these locations and avoid them as much as possible, by substituting one crop for another year after year. Those who have not tried rotation for this reason alone will be surprised at its effectiveness. In the small home garden a wide rotation is of course out of the question and other methods must be resorted to. The planting of an occasional row of

tender, quick growing plants such as are known to be attractive to the pests, will do much to detract the enemy from the main crop. Inverted cabbage leaves laid on the ground will also often form an attractive hiding place for insects, where in the early morning they may be gathered in large numbers and destroyed. Cut worms, grass-hoppers and beetles and other biting and chewing insects may often be waylaid by poisoned baits. Spread 1-8 inch thick on a cabbage leaf, a mixture of 10 parts wheat bran and 1 part white arsenic or paris green by weight—the whole to be moistened with just enough sweetened water to allow it to fall apart readily. Place such poisoned leaves freely among your growing plants, renewing them every evening throughout the period when pests, especially cut worms, are troublesome.

Poultry must of course be excluded where poison is laid. Young ducks have been found to be great foragers after caterpillars and grass-hoppers. An experiment recently tried by a neighbor on our recommendation has proven very effective, and is worthy of further trial. Hand picking of wingless insects is largely practiced by the Chinese gardeners, and while effective in their hands, few of us have the patience to carry this method to a successful issue.

For sucking and scale insects edible poisons are of course useless, and insecticides that act as external irritants, or form impervious coatings to smother the insects treated must be resorted to. The vegetable gardener has to do with the former only, because the succulent class of plants he has to deal with, are rarely or never attacked by scale insects, nor can such plants resist the resin washes used. The writer has found no more effective remedy than a good common soap wash applied in the form of a good forcible spray. One to three pounds common laundry soap dissolved in 5 gallons hot water, applied before sunrise or after sundown answers all ordinary purposes, although a second and third application may be necessary. Delicate foliage is not injured by this wash, while the kerosene emulsion unless very dilute and perfectly made does frequent damage to tender plants.

We have also found a tobacco decoction made by boiling 1 pound leaves or stems in 2 to 3 gallons of water for half an hour, very effective against plant lice and it is much used on green house-plants, although the common soap solution has



proven the simplest and best in our experience even for mealey bug on the alligator pear. Lastly destroy all infested litter by burning.

For a fuller and more detailed list of standard insecticides, the reader is referred to the very excellent Hawaii Experiment Station Bulletin No. 3 (revised), entitled Insecticides for Use in Hawaii, which may be had free by addressing: Jared G. Smith, Special Agent in charge of the Station.

FUNGUS DISEASES OF GARDEN PLANTS.

"An ounce of preventative is better than ten pounds of cure."

Blights, mildews and rusts come under this head, and they seem especially favored by hot and humid atmospheric conditions following a cool spell. Great advance has been made in recent years combatting these diseases, but it is in preventative measures rather than in curing plants when once attacked, no practical means having yet been devised whereby the growth of the thread-like mycelium (as the roots of fungi are called) can be destroyed after they have once entered the tissue of the attacked leaf or stem without destroying the plant itself. The purpose of spraying with a fungicide then, is wholly a preventative measure and must be applied before the disease has taken a root-hold.

Fortunately, most fungus spores succumb to the effects of copper salt's solutions, the standard among which is known as Bordeaux mixture and is prepared as follows:

Dissolve $\frac{1}{2}$ pound copper sulphate (common blue stone, under which name it is usually sold at half the price as when called for by its chemical name) in $2\frac{1}{2}$ gallons of water in a wooden pail. Slack $\frac{1}{2}$ pound fresh lime in $\frac{1}{2}$ gallon hot water, stirring and rubbing till completely slacked. When the lime is cool put the blue stone solution into a five gallon keg and add the lime which has previously been strained. Stir in additional water enough to make up the five gallons, and it is ready to be applied in the form of a fine spray. It's objectional use on garden vegetables is the bluish white discoloration left on the foliage after its use, to avoid which the following may be substituted:

Dissolve $\frac{3}{4}$ ounce copper sulphate in 1 quart of warm water, and 1 ounce of washing soda in another quart of warm water.

When both are cool, mix them together and add 5 ounces of washing ammonia. Let the mixture stand until clear, add cold water to make five gallons.

The powdery mildews of the grape and rose are best treated with dustings of flower of sulphur, which may be applied from a perforated tin-can. The success of all treatment depends upon the intelligence with which the mixtures and solutions are prepared and the seasonableness and thoroughness with which applied. In closing these few brief notes on insect pests and plant diseases the reader is again reminded that half the battle is fought in destroying all infested vegetation, by burning, and practicing intelligent rotation, and giving some study to the matter of resistant varieties. Although these precautions impose much limitation, they are worthy of consideration when it is remembered that the production of vegetables is dependent upon them.

A PARTIAL ACCOUNT OF INSECTS AFFECTING TOBACCO IN HAWAII.

BY D. L. VAN DINE,

Entomologist, United States Experiment Station, Honolulu.

(Continued from March Number, p. 76.)

THE FALSE BUD-WORM.

(The larva of *Heliothis armiger*=*H. conferta*.)

(Sub-order, *Heterocera* or moths. Family, *Noctuidæ*.)

This pest is widely distributed in the United States and Southern Canada and is a very general feeder. The principal products subject to its attack are the ears of maize, cotton bolls, the fruit of the tomato and the buds and seed-capsule of tobacco. Other food plants recorded are pumpkins, peas, beans and hemp. Meyrick records the species from the islands of Hawaii, Maui and Lanai and Blackburn from Maui and Oahu.¹

The false bud-worm is not a tobacco pest primarily but in the absence of other food plants will infest the young tobacco buds.

¹ I. Fauna Hawaiiensis. Vol. I, Part 2, 1899, p. 152.

The insect is most widely recognized under the common name, the "cotton boll-worm." Regarding its appearance in tobacco fields, Howard says:

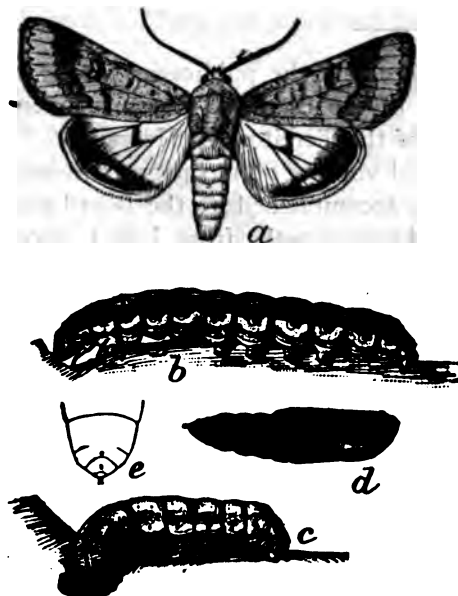


Fig. 4. The false bud-worm of tobacco, *Heliothis armiger*: a, adult moth; b, dark full-grown larva or worm; c, light-colored full-grown larva; d, pupa. Natural size. (From Howard.)

The eggs are deposited in the bud, and the larvæ do very serious harm by feeding on the young and as yet unfolded leaves. A large worm may quite devour a bud. In color and markings the false bud worm is one of the most variable of caterpillars. On tobacco the writer has found specimens of a uniform, light green color, without spot or stripe, and others the general effect of which was nearly black. This insect, like the true bud worm, passes the winter in the pupa condition under the surface of the ground.

Even if the young buds are not destroyed, the resulting holes would prohibit the use of the leaves for wrapper purposes.

REMEDIES.

Cultural methods as already outlined and the arsenical mixtures as recommended for the flea-beetle and split-worm will control the false bud-worm under ordinary conditions. Should it occur in any numbers, special efforts must be directed toward its destruction. Mr. Quaintance thus describes a common practice in Florida:

A very usual practice, and one that has proven to be quite satisfactory, is to sprinkle poisoned corn-meal in the bud. The poisoned mixture should be prepared as follows: To a quart of finely ground corn-meal, add a half teaspoonful of Paris Green and mix thoroughly by stirring. To apply this, a sprinkler should be made by using a baking powder can, in the lid or bottom of which numerous holes have been punched so that, when it is shaken, the poisoned corn-meal may be peppered over the bud. The poison should be applied frequently, and after heavy rains. In the case of large plants it may be necessary to open the buds with the hands and drop in a pinch of poison.

(To be continued.)

ANNUAL REPORT OF THE BOARD OF AGRICULTURE AND FORESTRY.

It is a pleasant duty to chronicle the publication early in March, of the "First Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii."

The report is a paper-bound volume of 170 pages and sets forth in some detail the work accomplished by the Board and its Divisions, during the eighteen months from July 1, 1903, to December 31, 1904.

The report of the Board itself covers 32 pages. Then follows that of the Division of Forestry, by Ralph S. Hosmer, Superintendent of Forestry, with supplementary reports by David Haughs, Field Foreman, and by the various District Foresters throughout the Territory. In all 86 pages.

The work of the Division of Entomology is covered by reports by Messrs. R. C. L. Perkins and G. W. Kirkaldy, now of the Hawaiian Sugar Planters' Association Experiment Station, Alexander Crow, Superintendent of Entomology, and Jacob Kotinsky, Assistant Entomologist. In all 42 pages.

The Agricultural work done under the auspices of the Board is described in the report of Jared G. Smith, Special Agent in charge of the Hawaii Experiment Station. Ten pages.

The report was printed by the Bulletin Publishing Co., Ltd., of Honolulu.

The following general summary gives the salient features of the several portions of the report:

BOARD.

The report of the Board opens with a brief statement concerning its organization, with the names of the Commissioners, and a list of the Committees through which the work of the Board is carried on. When the Board was organized "it found itself quartered in two rooms in the basement of the Executive Building, dark, stuffy and entirely inadequate in every way." Accordingly the old potting shed at the Government Nursery on King street was floored, ceiled and painted, and transformed into comfortable and commodious quarters. In the building are a large library room, where the Board

meetings are held, a museum room for specimens of woods and fruits, and offices and laboratories for the two Divisions.

Next follows a statement of the "Powers and Duties of the Board." These are discussed under four sub-divisions, as follows:

1. General objects. Powers and Duties.
2. Matters appertaining to Forestry.
3. Matters appertaining to Entomology.
4. Matters appertaining to Agriculture.

Under the first heading is given a list of the publications in the library of the Board. In all, with the library of the Hawaiian Stock Breeders' Association, which is temporarily deposited with the Board, there are 332 bound volumes and 3164 pamphlets and unbound publications.* The library is open to the public.

During the 18 months the Board published a reprint of Act 44 of the Session Laws of 1903, one bulletin, two circulars and one press bulletin. The several rules and regulations relating to the introduction of plants, fruits and insects into the Territory are given in full.

Lists of the Hawaiian woods and the native and other fruits in the Museum are also included.

Under the headings "Forestry," "Entomology," and "Agriculture," the organization and scope of each Division is briefly outlined.

At the close of the Board's report are tables showing the expenditures of the Board for the fiscal periods from July 1, 1903, to December 31, 1904; January 1, 1904, to June 30, 1904; and for the first six months of the present fiscal period, July 1, 1904, to June 30, 1905. There are also estimates of the appropriations desired by the Board for the work during the biennial fiscal period, beginning July 1, 1905.

The report of the Board is signed by the six members of the Board of Commissioners of Agriculture and Forestry:

Lorrin A. Thurston, W. M. Giffard, James D. Dole, C. S. Holloway, A. W. Carter and J. F. Brown.

*As the library is constantly receiving accessions the number of publications now available for reference, April 15th, considerably exceeds the figures given above.

FORESTRY.

The Annual Report of the Superintendent of Forestry may be thus summarized:

The past eighteen months have been an interesting period in the history of forestry in Hawaii because of the visit of Mr. William L. Hall of the U. S. Bureau of Forestry, the appointment of the local Consulting Foresters, in the several districts of the Territory, and the beginning of actual forest work with the arrival in January last, of the Superintendent of Forestry, Mr. Ralph S. Hosmer.

During the past year the Superintendent of Forestry has visited and become acquainted in a general way, with each of the large islands in the group, except Molokai. In a number of districts detailed work has been done, the studies on the ground being followed in most cases by published reports, with recommendations.

Two forest reserves have been set apart, under the law, by proclamation by Governor Carter: Kaipapau, in Koolauloa, Oahu, 913 acres; and the section between Waipio Valley and the Kohala line in the north end of Hamakua, Hawaii, 17,000 acres, more or less.

Large forest reserves on Kauai, Maui, and Hawaii are almost ready to be proclaimed. Others are pending on Oahu and in Kohala and South Hamakua, Hawaii. While still other areas only await investigation and report to be ready for reservation.

Other work of the Division of Forestry has been the putting of the Government Nursery on a business-like basis, by transforming it from a distributing point for ornamental plants into a strictly forest Nursery where new and untried species can be studied and propagated. Much seed of native and exotic trees and shrubs has been collected and is on sale to the public at prices just covering the cost of collection. This seed is warranted pure and fresh and being from local trees has the advantage of being acclimated. The grounds of the Government Nursery have been improved through the removal of poor and duplicate specimens, and the remaining trees have been labelled, making the garden of much greater value and attractiveness.

Advice and assistance has been given to a number of persons, concerning the best methods to be pursued in planting trees for pleasure or profit, and in the management of woodlands in accord-

ance with the dictates of practical forestry. The Division of Forestry stands ready, so far as it is able, to answer all requests of this nature.

An herbarium has been begun, an exhibit of native Hawaiian woods properly prepared and installed and collections of forest photographs, forest statistics and forest maps started. The Library of the Board has been increased and made available for use by the public for reference, and the routine office work of the Board and of the Division of Forestry systematized and made efficient.

The Division of Forestry is in close touch with the U. S. Bureau of Forestry, from which intercourse many benefits are derived.

Reports by Mr. David Haughs, Field Foreman of the Division of Forestry, and by the several Consulting Foresters, for their respective districts, accompanying the report of the Superintendent of Forestry, telling in detail of various phases of the forestry work throughout the Territory.

In the plans of the Division of Forestry for the coming year the creation of forest reserves takes first place. Following the setting apart of the several reserves now practically assured on Kauai, Maui and Hawaii, investigations leading to other forest reserves on these islands and on Oahu will be taken up and vigorously prosecuted.

With the creation of the forest reserves will come also the organization of a carefully planned forest ranger system to administer the reserves when they are set apart.

The various other lines of work undertaken by the Division will each be carried on and developed as far as time and appropriations allow. There is much to be done, for the field for forestry work in the Territory is a large one.

Thanks to the strong public opinion in favor of forestry throughout the Territory, the outlook for the coming year is most promising. At its close there should be many tangible results of work accomplished.

ENTOMOLOGY.

Owing to the absence of Mr. Koebele, the Supt. of Entomology, during the period covered by the report, and of Mr. Perkins, as assistant, during the latter part of this period, and finally, in consequence of the appointment of new officials during August and

September, this report is composed of three different regimes. The first report is that of Mr. Perkins, the then Assistant Superintendent of Entomology under the Board, and covers briefly the work of Mr. Koebele and himself performed during August, 1903, to May, 1904. This consisted, principally, of a search for an effective parasite against the leaf-hopper of sugar cane. Most of the work was done at Columbus, Ohio, where Mr. Otto H. Swezey had previously discovered parasites upon grass leaf-hoppers. Mr. Perkins estimates that not less than 3,000 cocoons of parasites, out of the many more that were bred, were sent over by Mr. Koebele. The work at this end was attended to by Mr. Perkins, and Messrs. Kirkaldy and Terry who had by that time arrived to assist him. Unfortunately, many of the insects sent, died en route and many were found infested by hyperparasites. When cold weather had closed the season in Ohio, Mr. Koebele after conferring with the entomologists at Washington, went to California whence he shipped numbers of leaf-hopper parasites and other insects. Greater success was had with the California parasites, principally because the journey was shorter and the climate more akin to ours. Many of these parasites were liberated and observed in the act of attacking young hoppers.

Mr. Perkins lays much stress upon the value of the experience acquired by Mr. Koebele in Ohio and California in the manipulation of various enemies of leaf-hoppers. The information gained was of great assistance to them in their investigations in Australia for which country they sailed in May, 1904.

In behalf of Mr. Koebele, Mr. Perkins concludes with an expression of thanks to the entomologists at Washington, Ohio State University, and Mr. Craw for valuable assistance rendered.

The report of Mr. G. W. Kirkaldy as Acting Superintendent at the concluding date of his report August 12, 1904, covering the period beginning with May 18, 1903, follows.

Mr. Kirkaldy delineates the successive organizations of the Entomological Division, and dwells upon the change of quarters from the Capitol to the Government Nursery. With Professors Koebele and Perkins away in Australia in search of a parasite for the cane leaf-hopper, the work of inspection, fumigation, and office routine devolved upon himself and Messrs. Terry and Austin.

Tabulated by states and countries the author gives the number of consignments of plants, roots, fruits, vegetables, etc., received

at the port of Honolulu and the number passed, fumigated, and destroyed, with the reasons for the measures taken. Most of these reasons were sufficiently important to have a letter addressed to the Board with suggestions upon the regulation of plant importation into the Territory. In this letter particular emphasis is laid upon the necessity of guarding against importation dangerous pests from China, Japan, and other Eastern Pacific ports, and absolute exclusion is advised.

Under the caption "Insects of the Year," the author claims one year's residence insufficient to speak authoritatively upon the subject. He could not, however, overlook the insects most prominent in doing injury or good. Among the latter, the distribution of lantana insects is referred to, and a reply from Dr. Howard on the "Guatemalan Ant Question" quoted. Among the injurious insects, a moth attacking koa seeds is mentioned. The rose leaf-roller (*Cacoecia rosaceana*) is given attention by description of three stages of the species, and a suggestion for saving rose bushes from its depredations by pinching the curled clusters of leaves is offered. The horn-fly is reported as troublesome in certain districts, and a thorough investigation is suggested. A hint at the life history and habits of the insect and the species of flies with which it is frequently confused are given.

The lamentable inadequacy of library facilities account for the inability to determine alligator pear borers, of which complaints were made. The Japanese beetle inflicted its usual amount of damage. The "torpedo bug" (*Siphanta acuta*) is reported as having extended its ravages to coffee at Maunawili where it is attacked by an entomophthorous fungus.

While performing the duties of inspector Mr. Kirkaldy found it incumbent upon himself to urge to the Board the necessity of encouraging citrus culture in the Islands, although the subject is beyond the entomologist's sphere of activity. In the letter to the Board, the remarkable fact is disclosed that on one and the same day 43 boxes of citrus fruits were received from California on one hand, and on the other, an inquiry from Hawaii for suggestions for shipping similar fruits to the coast!

The advisability of introducing bats as discussed by Messrs. L. G. Blackman and Perkins in the "Forester" for May, 1904, is referred to.

Mr. Craw's Report.

Mr. Craw has only been in office since September 12, 1904, and is brief of necessity. Immediately upon arrival, Mr. Craw had built under his direction air tight fumigation houses on two of the docks in order to save the time and trouble of carting stuff to the Nursery grounds and the danger of an undesirable insect escaping in course of transportation. As in California, he uses hydrocyanic acid gas for fumigation. Mr. C. J. Austin assists him in this work. An appreciation is offered to the Collector of Customs, E. R. Stackable, and other customs officers for valuable assistance rendered in the search and detention of plant life for Mr. Craw's examination.

The hundred vessels that reached the port of Honolulu from August 12, to December 31, '04, brought 54,721 packages of fruits, vegetables, and plants, and every one of these was examined, a good many fumigated, and some destroyed. Since the inauguration of this rigid inspection, exporters have taken warning and ceased to ship low grade fruits and plants. The cleanliness from pests and the good quality of vegetation now brought here superimposed by a note of warning distributed among shippers is highly gratifying.

Mr. Craw points to the incalculable damage inflicted by the melon fly (*Dacus cucurbitae*), a comparatively recent introduction, and in order to prevent similar introductions, he was instrumental in the issuance of General Circular No. 2, of this Board, prohibiting the importation of fresh fruits from certain quarters of the globe. A number of instances are cited where the work of inspection has saved this Territory from the introduction of possible new pests. It is notable that practically all of these applicants for admission hail from the Orient. Even the mails bring packages, and none of the pass unexamined and unattended to by Mr. Craw. The customs officials usually have first claim upon shipments received. As there is danger of injurious insects escaping before they are attended to by the United States officials, Mr. Craw appealed to the Treasury Department at Washington through the Secretary of Agriculture, for the permission to examine imported plants immediately upon their arrival. Both Mr. Craw's letter and the courteous reply with promise of co-operation are incorporated in the report as well as the fact that the necessary authority has been granted by the Treasury Department.

In the strongest terms, Mr. Craw indorses the efforts of the

Board in the introduction of beneficial insects and lauds the praiseworthy work in this line of Koebele, Compere, and Perkins. In connection with the leaf-hopper, he chronicles his confidence that the parasite recently introduced from Australia by Messrs. Koebele and Perkins will check the nefarious work of the destructive insect. In all, 18 specimens of the parasite were liberated on a plantation during October and November by Messrs. Craw and Terry. On December 28th last, this plantation was again visited and the parasite reported as established. But cane insects are now studied by the entomologists of the H. S. P. A. Experiment Station; and all information touching these insects is referred to them.

Experiments for the introduction of parasites of the "torpedo bug," enemies of the horn-fly, scale insects, and plant lice are discussed by Mr. Craw, but time is too short to determine whether any of them were established.

Report of Jacob Kotinsky, Asst. Entomologist.

Most of the office work as breeding, distribution of beneficial insects, care of laboratory, apparatus, and books were attended to by Mr. Kotinsky. For work done with living insects, he refers the reader to pages 153 to 159 of the report. He records in his table of introductions 19 species, comprising 500 specimens of beneficial insects most of which are new to the Islands having been introduced since June 22nd. These represent about 25 per cent. of all the specimens sent and are regarded as a good percentage. The table of distributions shows 82 colonies of beneficial insects distributed up to the last of the year. He has observed that the rains have helped the fungus in checking the ravages of the Japanese beetle, and that the aphid eating lady birds keep the plant lice well subdued.

He reports the lack of apparatus and books being overcome by ordering necessary supplies. In a business-like manner, he has instituted card catalogues in the entomological library, for records of introductions and distributions of beneficial insects, and identifications of all sorts. With an eye to improving the insect collection, he is saving whatever material reaches the office that is not used for breeding purposes. This report is concluded by an enumeration with brief resumes of entomological publications by the staff since the Board was established. A close examination of the appended tables above referred to may prove of interest and value to some readers.

AGRICULTURE.

The Territorial Legislature appropriated, at its special session in June, the sum of \$228.00 per month to assist the Hawaii Experiment Station. The sum expended from July 1, to December 31, 1904, totals \$1509.32.

The larger share of the appropriations made by Congress for this Station (\$15,000.00 per year) during the past four years has been used in getting an equipment, a place to work and something to work with. The experiments carried on and the bulletins and reports published have been accomplished rather in spite of obstacles than with outside assistance and support.

The Station now has on the reservation near Honolulu, one concrete laboratory building for the Chemist and Horticulturist; one laboratory and insectary for the Entomologist; four dwellings; seven laborers' quarters; stables and outbuildings; one-half mile of wire fencing; over 6,000 feet of water pipes; tanks holding 45,000 gallons of water; and improvements in the form of roads, trails, grading and clearing of land. The Station owns one work horse, one carriage horse, one saddle horse and one mule at Hilo.

Tobacco: This Station has $1\frac{1}{4}$ acres of tobacco at Pohakea, in Hamakua. One acre has been covered with tent cloth. There is a good equipment in the way of tool shed and seed beds. A small shed is being enlarged to serve as a curing barn. A report in regard to the Hamakua tobacco experiment is in preparation and will probably be published in about a month.¹ The results of the first year's work indicate that Hawaii can grow high class cigar tobacco of both wrapper and filler types.

Bananas: An extended study of bananas has been made during the last year and a collection of varieties is planted on the Station experimental plots and also on lands at Hilo under our control.² A number of experiments have been started to determine the relative merits of different methods of cultivation, planting and fertilization.

The shipment of Bluefield bananas received early in January was planted at the Station. We have on hand 145 Bluefield bananas in Honolulu and 130 in Hilo. One hundred and

1. Since published as Press Bulletin No. 12 of this Station.

ten of the 325 corms planted grew or threw out suckers. There has been an increase of 165 plants during 1904.

Mangoes: Between thirty and forty varieties of mangoes have been studied. Many of these varieties are of commercial value and a trade in the finer sorts can undoubtedly be built up in the mainland markets. A mango nursery is being established on the Station grounds for propagation and other experiments. Last year the mango crop was nearly a complete failure in parts of the Islands due to a fungus disease determined by the micologists of this Department to be a species of the genus *Colletotrichum*.

The Alligator Pear: Even less is known about budding and grafting the Alligator or Avocado pear than is known of the mango. There is no certainty that a seedling tree will produce a crop of even fair fruit, and providing the tree can be propagated by a simple method of grafting or budding, it will be possible to establish orchards giving a uniform production of fruit. An experimental plot of Mango and Alligator pear trees is in a flourishing condition on the mauka lands of the Station tract where the Eucalyptus trees were cut away in 1901, giving them a chance to grow. This orchard, partly grown and ready for experimental use, is a valuable adjunct to the Station equipment.

Citrus Fruits: Large importations of Citrus fruits should not continue in a country so well adapted to Citrus culture. A bulletin giving simple instructions for those who wish to grow these fruits will soon be issued by this Station. A study of the relative adaptability of stocks for different Citrus fruits under our local conditions will be made. This study will involve several years' work.

Cacao: The Station controls five acres of land in Hilo for experiments in the production of Cacao. Three acres have already been prepared for planting. Different varieties of Cacao will be tested and experiments conducted in different methods of cultivation and in propagation by budding and grafting.

Rubber: Rubber, at present attracting considerable local attention, has not been considered experimentally by this Station because of lack of funds. A few different kinds of rubber-producing plants have been grown and some considerable

2. See Bulletin No. 7 of this Station.

study has been given to the industry as conducted elsewhere. It is designed to publish a brief press bulletin giving the cultural instructions.

Plant Breeding: Many new and valuable creations in plant life are appearing every year. By proper cross-fertilization and hybridization and by judicious selection it is possible to produce any desired form within reasonable limits. As examples of local problems, the rice grown here does not meet the demands of the Japanese and consequently thousands of dollars worth of rice is being imported. The task of the plant breeder would be to create a variety approximating the Japanese form but suited to Hawaiian conditions. It is not at all impossible that varieties of watermelons, muskmelons and other Cucurbits could be originated, resistant to the melon-fly. It is desirable to take up work of this character.

Miscellaneous Work.

At the Station investigations are being made relative to Hawaiian Tan Barks; the Cultivation of Cassava; Experiments with Bananas; the Nature and Method of Control of the Mango Disease; the Chemical Composition of Grasses and Forage Plants; Grafting and Budding the Mango and Alligator Pear; Relation of Humus to Fertility; Citrus Fruits; Silk Raising; and Insects Injurious to Crops.

There are many important lines of investigation which would well repay the expenditure of a much larger Territorial stipend than has thus far been given us.

Recommendations.

Tobacco: I would like an appropriation of \$3000 per annum for two years to continue the tobacco experiment at Pohakea and extend the cultivation to other Districts of the Islands where suitable tobacco soils exist.

Silk: I would like an appropriation of \$1500 per annum for the purpose of demonstrating the practicability of producing raw silk in Hawaii. The production of raw silk is not considered sufficiently remunerative to engage the time of the whole household, but the promotion of the care of silkworms of families of plantation laborers would lead to more stable labor conditions.

Coffee: I would like an appropriation of \$1500 per an-

num for two years for an investigation of certain phases of the coffee industry. If coffee were sold in the world's markets in accordance with merit as determined by aroma and flavor, I believe that Hawaiian coffee would be at the top of the list. Unfortunately this is not the case, and methods of grading, polishing, cleaning and fermenting the berry must be undertaken to have our product compare with such brands as "Old Government Java" and "Old Mocha."

Horticulture: I would like an appropriation of \$1000 per annum for two years to continue experiments in the shipment of mangoes, papaias, Alligator pears and other fruits in cold storage to the Eastern markets. It is possible to work up a good market on the mainland for tropical fruits. We have made one successful shipment of Alligator pears to New York City.

Green House: The resources of the Station will not permit the erection of a green house for some years to come. It is necessary for economy of time and effort that a plant house for the study of fungus diseases, cross pollination of flowers, production of new varieties, and the propagation of economic plants for distribution be provided at once. I would like an appropriation of \$3000 for this purpose.

Irrigation: Without water for irrigation during the dry summer months practically nothing can be grown. This Station is much in need of an improved water supply. To provide an adequate water supply for irrigation of crops I would like an appropriation of \$10,000, for the construction of a 3,000,000 gallon reservoir just below the forest on the upper part of our reservation.

This would make a total appropriation for the biennial period of \$27,000, a less sum than is appropriated by Congress.

MONTHLY LIST OF AGRICULTURAL PAPERS.

The following list, while in no way attempting to be exhaustive, is prepared in order to bring to notice such papers as appear during the month and relate to matters of local interest. We shall be glad to assist correspondents to procure any of the following:

"How America Educates the Farmer," by F. J. Howell, Ph. D.

"Canadian Cheddar Cheesemaking," by J. C. McMillan, N. D.
D. *The Journal of the Department of Agriculture of Victoria*, Jan., 1905.

"The Place of Fruits in the Human Dietary," by Dr. Abramowski. *Journal of the Department of Agriculture of W. Australia*, Perth.

"The Timeing of Bananas," *The Journal of the Jamaica Agriculture Society*, Feb., 1905.

"The Cultivation of Ground Nuts," *The Tropical Agriculturist*, Dec., 1904. Colombo.

"Wither Tip and other diseases of Citrus Trees and Fruits," by P. H. Rolfs, Pathologist in charge of Subtropical Laboratory. *Bulletin of the Bureau of Plant Industry, Veg. Path., and Phys. Investigation*. U. S. Department of Agriculture, Washington.

"Notes on the Cultivation of Coconut, Sugar Cane, Coffee and Cocoa, for a small cultivator," by W. M. Cunningham. *Bulletin of the Department of Agriculture*, February, 1905, Kingston, Jamaica. 3 pence.

"Report of the Honolulu Park Commission to the Legislature of the Territory of Hawaii, Session of 1905. Hawaiian Gazette Co., Honolulu.

"Citronelle et Lemon Grass," *Le Journal d' Agriculture Tropicale*, February, 1905, Paris.

"The Training and Pruning of Trees and Vines," by Professor Charles A. Keffer. *The Western Fruit Grower*, Feb., 1905, St. Joseph, Missouri.

"The Production of Early Tomatoes," by George Quinn, February, 1905. "Principles Involved in Improvement of a Herd, either for Beef or Milk," March, 1905. *The Journal of the Department of Agriculture of South Australia*, Adelaide.

"Coconut Cultivation." *The Journal of the Jamaica Agricultural Society*, January, 1905. 3 pence.

FARMERS' INSTITUTE OF HAWAII.

NOTICE OF MEETING.

Honolulu, April 18, 1905.

The next regular meeting of the Farmers' Institute of Hawaii will be held at Wahiawa, on Saturday, May 6, 1905, at 7:30 P. M.

The following program will be presented:

Co-operative MarketingMr. Jared G. Smith.

The Honolulu Milk SupplyMr. R. A. Duncan.

A So-called Pineapple "Disease" . .Mr. B. O. Clark.

A meeting for the transaction of business will be held at 4 P. M. The public is cordially invited to these meetings.

Arrangements have been made so that those attending may secure lodgings at the Y. M. C. A. and Y. W. C. A. vacation houses at a nominal charge.

J. E. HIGGINS,
Secretary-Treasurer.

RESOLUTIONS PASSED BY THE BOARD OF AGRICULTURE AND FORESTRY UPON THE DEATH OF MR. FRANZ BUCHHOLTZ.

At the meeting of the Board of Commissioners of Agriculture and Forestry held on March 22, 1905, the following resolutions regarding the late Franz Buchholtz were passed and ordered sent to the members of his family:

RESOLVED, That the Board of Commissioners of Agriculture and Forestry express their appreciation of the services rendered by the late Franz Buchholtz to the cause of Agriculture in this Territory, and their deep and sincere regret at his death.

RESOLVED, That it is the sense of the Board that in the death of Mr. Buchholtz, the Territory of Hawaii loses an estimable citizen and a man of a type much needed in this community. Mr. Buchholtz was a fearless enthusiast who demonstrated by experiment and example, what a determined man can do notwithstanding obstacles and difficulties. Even in the face of discouragement and seeming failure, Mr. Buchholtz kept his faith in the future and his sturdy belief in the ultimate

development of his adopted country as a land of self-supporting homes. He was a man whose memory we shall do well to cherish.

THE ARAUCARIAS.

An interesting article on the Araucarias appears in a recent number of the Journal of Horticulture. The Araucarias form one of the few existing genera of plants which link the flora of the present day with that of geologic ages. This peculiarity is shared in varying degree by the whole family of conifers, including their relatives the cycads. At one period of the earth's existence, termed the reign of the Gymnosperm, these types constitute a large part of the vegetation. Very little literature is available on this interesting subject, and it is to be regretted that the article referred to says nothing regarding the seeding of "excelsa" which does so well here but whose cones so far have not yielded fertile seed in Hawaii.

CORRESPONDENCE.

Honokaa, Hawaii, March 10th, 1905.

Editor Forester.

Dear Sir: As a reader of the Hawaiian Forester and Agriculturist, and being interested in "diversified industries" and the proper development thereof, I wish to inquire if you or any of our readers know of any book, pamphlet or article on the subject of diversified industries, and if so where it can be

WILLIAMS.

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THE HAWAIIAN FORESTER AGRICULTURIST

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MAY, 1905

No. 5

We take great pleasure in presenting this month an able paper by Mr. Donald MacIntyre on the cultivation of Mangoes. Although such a favorite fruit and one so generally grown in these islands, the majority of mango trees here are of inferior quality, and until lately little attempt has been made to improve our stock. Much good might be done in this respect by the importation of choice varieties of trees and the dissemination of scions and grafted seedlings by reliable nurserymen. Mr. MacIntyre's article describes various methods of grafting in a way that any one familiar with gardening may follow with success. Excellent results have been already attained by Mr. Gerrit Wilder in grafting mango and other fruit trees, and we hope to see a growing interest in this important department of agriculture. Of late years a fungoid disease has attacked the mango fruit in many districts of this Territory and practically ruined the crops. Instructions are given in the following article as to how to control this on small trees, but the subject is of such importance that a thorough investigation of this pest by the proper authorities would be very timely.

Mr. Van Dine's series of articles upon insects affecting the tobacco industry in Hawaii will be concluded next month. Mr. Van Dine has in preparation, for publication in The Forester, an account of the results attained in the experiments he has lately been conducting in the propagation of the silk worm.

In answer to the enquiry of a correspondent requesting literature on the Frog, we would direct him to an article by F. M. Chamberlain, entitled "Edible Frogs of the United States and this Artificial Propagation," which is published in the Report of the U. S. Fish Commission, 1897, part 23, pages 249-261. The paper in question contains six illustrations.

Special attention will be directed in the June number of this paper to the late legislation affecting agriculture, and particularly to that relating to the declaration of public park land.

CULTIVATION OF THE MANGO IN HAWAII.

BY DONALD MACINTYRE.

The mango, *Mangifera indica*, is a fruit well adapted to our climate. It is difficult to compare different kinds of fruit, but I should say the mango ranks next to the pineapple in these islands at the present time, and the flavor of a really good mango is a long way ahead of the flavor of any pineapple. That mangoes do well here is evident to the most casual observer; one has only to look at the thousands of flower spikes to be seen just now, to satisfy oneself on that point. The in-



GRAFTED SEEDLINGS IN BLOSSOM.

dications are that this year's crop is going to be tremendous. The only thing that can damage it now is a strong Kona, or northeast wind. The reason for the unusual abundance of blossom this year may be, that because of the long-continued drought and cold weather, growth has been retarded and the shoots have consequently been able to ripen and develop their flower buds properly. In India at and near Bombay, it is the practice, at the end of the rainy season, to apply about ten

pounds of common salt to each large tree. The effect of this is to arrest the growth of leaves during October and November, and thereby to encourage the formation of flower buds. The salt, of course, is only used to arrest leaf development, and this would be brought about by other means, such as cold or drought. The mango needs a deep and well-drained loam to grow it to perfection, and it enjoys a good deal of water—a rainfall of from fifty to eighty inches distributed throughout the year, or irrigation to that extent is desirable. Though requiring this amount of moisture to grow properly, a mango tree stands a good drought before it succumbs. I have planted mangoes on dry hill sides, of course during wet weather when the plants could get a start—together with *Grivillea*, *Eucalyptus*, *Causarina*, *Eugenia*, and *Schinus molle*, and find that with the exception of *Schinus molle*, the mango stands a continued drought best of the lot. The plants, of course, did not move during the dry spell, but after a good rain they made a nice growth. Some I planted in such position four years ago, though still small trees, are this year full of flowers. It will be understood that a dry hillside is not an ideal position for a mango tree, but where such a place has to be wooded, if not too much exposed to wind, the mango is not a bad plant to use. A well-grown seedling mango is one of the finest foliage trees we have.

TO PLANT THE MANGO.

Dig holes two and one-half feet in depth, and four feet in diameter. There are places where this extreme depth and width may not be necessary, but where the soil is stiff, the more thoroughly the ground is worked the better, and the little extra labor entailed in digging a decent hole pays in the long run. We occasionally see trees planted in little bits of holes, sometimes about eight inches each way. Such trees make small growth and then remain in the same, or nearly the same, condition for years. If a tree is wanted to make the best growth possible, and to give a return in fruit, it is necessary to expend some labor at the planting time. This applies to other trees as well as mangoes. Take a stiff soil that has never been worked, or only to a depth of six inches or so, one foot down it will be found to be as hard as a road; no air can penetrate it; and roots can make no growth. Roots require oxygen as well as the other parts of a plant. It is

a good plan to dig the holes about a month or so before planting, as the action of the atmosphere is beneficial to the turned up soil. Place in the bottom of the hole a lot of bones; bones are not readily soluble, but the roots get hold of them and they will ultimately yield up their constituents under the dissolving action of the carbonic acid of the root hairs. If the hole has been open for a month or so there will not be so much difference between the top and the lower spits of soil as there was at first. Mix them together and fill the hole, treading lightly to prevent sinking, to within an inch of the surface of the ground. The place is now ready for the plant. Make a hole in the centre a little larger than is required, and if it can be had, put in and around the tree a little free soil, such as old potting material, to insure the plant a start. Tread moderately and equally all around the ball and in most cases give a good watering. Do not break the ball when planting, as this only injures the roots, and if care is not exercised in this particular, during a dry spell the chances are ten to one that the plant will die. It is not a good plan to keep mangoes for a long period of time in pots before planting, for the ball becomes hard, the soil worn out, and the roots are consequently inactive and in such a condition that they do not take readily to the new soil when planted out. I find six inch pots a very convenient size for nursery work. My plan is to plant the seeds in four-inch pots singly (mango seeds retain their vitality for only a short time, but if sown right away there will be no failures.) As soon as they have made a good growth and are well rooted, they should be repotted into six-inch pots, and planted out the following winter, say in February, as much advantage being taken of rains as possible. By this means the plants will not be checked, and if properly attended to should make good bearing trees in from four to six years. In some cases it may not be convenient to plant at the time advised, or the plants may be wanted for stocks for grafting. Means must then be taken to keep the roots active. This can be done either by repotting into eight-inch pots or by fertilizing. I prefer the latter method for the reason that a six-inch pot is so much more easily handled than an eight-inch. It will often be found that a mango plant in a pot has no roots at the surface. In such cases I have found it beneficial to take as much of the surface soil off as possible, by scraping down the roots, and filling the pot up

with well decayed manure and soil in equal parts. This method brings the roots up and keeps the plant growing. I do not believe in applying animal manure directly to the roots of a mango tree when planting, as it is apt to encourage too strong growth and the time of fruiting is retarded. Manure is better put on the surface as a mulching around the plant after planting, where its constituents will gradually become washed in by the rain and irrigation, and its presence on the surface will keep the soil moist and prevent cracking. Twenty feet apart is a good distance to plant grafted mangoes, but a seedling tree may eventually have a spread of forty feet and more. If a regular plantation of mangoes is to be made, it is a good plan, both for economy and for the good of the tree, to make use of the ground between the rows. Such plants as Papayas and Bananas, grown in the intermediate spaces, will open up the soil and bring it into a condition to readily receive the mango roots as they spread. After these have served their purpose they can be removed and the ground doubly plowed as deeply as possible and as near to the mango tree as can be done without injuring the roots. A good sprinkling of bone meal as the plowing is in progress will be found beneficial to encourage lateral root growth in all directions. Sometimes one may have a favorite mango tree that is growing too slowly and is in a starved condition: such a state of affairs often comes from faulty planting. In such a case dig a trench right around the tree, taking care to begin far enough away from the trunk to prevent injury to the root. If no roots are found, gradually dig in towards the tree till roots begin to make their appearance, then fill in the trench, giving a good sprinkling of bone meal as the work progresses. Inside the inner ring of the trench, that is next to the trunk, sprinkle about a four-inch potful of soluble fertilizer. A mulching of stable manure will also be beneficial. The rapidity with which the tree will recover health after such an operation will well repay the labor.

FERTILIZER FOR MANGOES.

10% P_2O_5

5% NH_3

5% K_2O

The above is the formula for a fertilizer which I procure from

the Kalihi Fertilizing Works, for use with mangoes. I have found it of great benefit. It is soluble and has a quick action. Sprinkled on the surface and lightly forked in before irrigating the result is surprising. For young growing trees I use a four-inch pot full about four times a year for each tree.

GRAFTING.

With few exceptions all our mangoes in these Islands are seedlings. We have some of very fine flavor, but almost all are fibrey. Mr. S. Damon has imported several Wardian Cases of mangoes from India, of fine grafted varieties. Two of these fruited two years ago, and the flavor and composition of the fruit was all that could be desired. It was so free from fibre that it could be eaten with a spoon. The indications are that a number of these trees will bear this year. It is a very delicate operation to handle plants that have come such a distance, and in spite of the greatest care a number of them are damaged. From those received I have marched about fifty plants, all of which are doing well. Grafting by approach or inarching is the common method in India for reproducing good kinds of mangoes, and is the simplest method. Sometimes seedling mangoes come fairly true, the reason being that the flowers are fertilized by flies, which are more sluggish in their habits than bees. Seedlings can never be depended on, however, and the only sure way to reproduce a variety is to graft, bud, or layer. Woodrow, the Indian mango authority, says of grafting, "That it is practical to graft mango trees if not more than a foot in diameter, and in a short time convert them into trees bearing fruit of a high class, I distinctly affirm. Cut down a seedling mango tree, say about four inches in thickness, with a saw. This tree is technically called the stock. With a strong pair of scissors cut a well ripened shoot of the previous year's growth, about three-quarters of an inch in thickness, from a good mango tree. This branch, which is technically called the scion, has by the grafting knife a part pared away from two sides until there is a regular diminution from a point about six inches from the lower end downwards, the least thickness being about one-eighth of an inch. The side of the scion to be placed next the wood should be plain and the other side rounded slightly. In experienced hands the plain side may be at once reduced to the desired thickness, leaving a shoulder;

this makes neat work, but is more difficult and not essential. A slit through the bark is made with the grafting knife, as long as the prepared part of the scion. A smooth horn or bone, in shape like a dagger, is then inserted at the top of the slit, pressed downwards gently and the bark raised. The scion is then inserted, pressed firmly into its place and tied first with a strip of fibre from the stem of a banana plant and above that with strong twine. In the case of a large tree with thick bark, considerable force should be used in tying the graft. It is then covered carefully with grafting wax or clay and covered by the "Graft Protector," a simple contrivance which occurred to me in 1885. I believe it renders the making a true graft practicable throughout India. The Graft Protector is a large pot with a hole six inches square in the bottom which is inverted over the newly formed graft, a sheet of glass is luted on the hole, and a shade of green branches erected so as to keep the sun's rays from the sides of the pot. An open part of the shade should be left on the north side to admit light, and the graft watered on the outside of the pot three times daily. After the first three weeks the glass should be removed during dull days, and on bright days from sunset till the sun is well up next day. The proper season to do the work is an important matter. It is that season when, by the swelling of buds and the appearance of new leaves, a fresh flush of growth is expected."—Woodrow's Gardening in India.

GRAFTING BY APPROACH.

Grafting by approach is a very simple matter. Have as many common seedling stocks as required, started and growing in six-inch pots. Choose a time when the sap is running freely, which will be when the young leaves appear and before they turn green; take for the scion a branch on a good variety of mango tree; cut from this a slice about four inches long and about one-third through the stem; place the seedling stock conveniently near this and make a corresponding cut on it; place the two together, taking care to make inner barks meet, as it is there the junction takes place; bind firmly together and cover with grafting wax. In from two to three months the stock and scion will be united, and the latter may be severed from the parent tree. It is a good plan to cut the stem half way through about two weeks before completely severing it.

I have tried budding mangoes, but with little success. Out of several I have tried by different methods, only two have grown.



METHOD OF GRATING BY APPROACH.

GRAFTING WAX.

A good grafting wax can be made in the following manner. Take three parts each of resin and beeswax, and two parts of tallow. Melt all together in an iron pot, and allow to cool. This preparation will keep for a long time and should be used lukewarm.

AIR LAYERING.

Air layering is well understood. It consists in simply making a cut in the branch at the place desired and placing around it some fine soil kept in place by a piece of sack or some such material. If kept moist and shaded, roots will soon be

mitted and the layer can be cut off in about three months. A branch near the ground can, of course, be layered in a pot or box.

MANGO PESTS.

The worst enemy of the mango I have seen is a fungus which causes black spots on the fruits and ultimately causes them to rot. It occurs also on the leaves and flower stems, preventing the fruits from setting, or causing their fall when they are about the size of beans. In some parts of the Islands where it is moist, such as the windward side of Oahu, this pest has ruined the mango crop for some years. I find the fine Indian varieties more liable to attack here than the commoner kinds, but these, being grafted, do not grow tall and the fungus is therefore easily kept in check. Two sprayings with Bordeaux Mixture may be relied upon to destroy it. It is a good plan to spray just as the flower stems are pushing up, and before the flowers open. This kills any spores that may be present, which might settle and grow on the flowerstalk, and so prevent the fruit from setting.

INOCULATING MATERIAL FOR LEGUMINOUS CROPS.

The erroneous statements which recently appeared in the public press regarding the free and unlimited distribution of inoculating material for leguminous crops is likely to cause those who apply for these cultures to be disappointed. The publication of the results obtained with pure cultures in inoculating leguminous plants has resulted in such a demand for this material that the facilities of the Department have been taxed to their utmost and for some time it has been impossible to meet the demand; in fact, the total quantity which could be prepared this season was promised early in February.

January.

The patent which the Department holds upon the method of growing and distributing these organisms was taken out in such a way that no one can maintain a monopoly of the manufacture of such cultures and so as to permit of its being

taken up and handled commercially. The commercial product is being handled quite generally by seedmen. Upon application the Department has furnished all necessary information to the bacteriologists representing properly equipped concerns, but can not assume to make any statement which could in any way be regarded as a guarantee of the commercial product; nor is it prepared to indorse each and all of the somewhat extravagant claims occasionally made for this discovery. Those who desire to consult the Department's authorized statements should refer to its own publications, the latest of which is Farmers' Bulletin 214.

United States Depart. of Agriculture,
Washington, D. C., March 28, 1905.

*NEW POINTS IN THE FOREST POLICY OF THE
TERRITORY.*

The adoption by the Board of Commissioners of Agriculture and Forestry of the following four reports establishes certain points in its forest policy. As the action taken on the recommendations of the Superintendent of Forestry in these reports will probably serve as precedents in other cases where the conditions are similar and as the points involved are of general interest, the reports are given in full.

The report on the land of Kaohe 4, Hamakua, Hawaii, brings out the position of the Board on the question of the disposition of the so-called "waste land" above the area of good grazing country on the higher mountains in the Territory. The Board believes that land of this character should not be included with the better land as has been the custom in the past, but that it should be retained by the Government against such time as it may be utilized for some now unforeseen industry, or until it can be planted with forest trees from the temperate zone.

The report on the land of Nakula, Kaupo, Maui, emphasizes this same point, with reference to somewhat different conditions of slope, soil and aspect.

The report on Opihihale, South Kona, Hawaii, shows the Board's feeling in regard to the utilization of lands in that sec-

tion which might be developed for agriculture, and its judgment in regard to the protection of the belt of Koa forest.

The report upon the Olaa Remnant, Puna, Hawaii, outlines the position of the Board in regard to the utilization of merchantable timber on Government forest land.

In each case the Committee on Forestry expressed its approval of the recommendations of the Superintendent of Forestry, which reports were adopted by the Board as a whole.

The reports of the Superintendent of Forestry follow :

KAOHE 4, HAMAKUA, HAWAII.

Honolulu, T. H., Dec. 3, 1904.

Committee on Forestry,

Board of Agriculture and Forestry,

Honolulu, T. H.

Gentlemen.—I beg to hand you herewith a written statement of my opinion in regard to a portion of the Government land of Kaohe, Hamakua, Hawaii.

What is said below refers only to that part of the great land of Kaohe, known as Kaohe 4, which lies on the southwest side of Mauna Kea, above the lava flow of 1843 and the Keamuku flow and between the lands of Humuula, on the east, and Wai-koloa and Kaohe 3, on the west. The remainder of Kaohe will be reported on later.

The section in question is now used by the Humuula Sheep Station as grazing land for stock other than sheep. The eastern part is fenced in and used as a horse paddock. The lease on the land runs out in about two years.

Applications have been received for the lease of the land above described, up to a mauka line drawn at about the 7500 foot contour, as shown on the Government map of Hawaii; or, to be more exact, between the bases of puus (unnamed on the map) near the intersections of the 7500 foot contour line, as shown, with respectively the Humuula line and a straight line drawn from the base of Puu Ka Pele to the summit of Mauna Kea—the latter being the boundary between Kaohe 3 and 4.

The land in question is essentially grazing land. It is said by those who know the section, to be much better adapted for cattle and horses than for sheep. Springs on the slope above yield a

rather limited supply of water, which is piped down to troughs near the road. With the lease of the grazing land goes the right to further develop this water.

Over a considerable part of the land, especially on that mauka of the road, there is a fairly dense growth of Mamani (*Sophora chrysophylla*), making a practically pure stand, which extends up the mountain to above the point where the good grasses are no longer found.

On the trip around Mauna Kea, made last winter in company with Governor Carter, I crossed Kaohe. During the summer I again had an opportunity to see something of the tract from hills on adjoining lands, so that while I have not gone over the area in detail, I have a good general idea of the conditions thereon.

In common with a belt on the eastern slope of Mauna Kea, above the level of the Koa and Ohia forest, this part of Kaohe is primarily valuable for grazing. Although there is a considerable stand of Mamani on Kaohe 4, this in itself does not make it necessary that the land be set apart as a forest reserve. On the contrary, on this particular land, the value of the Mamani lies, to my mind, chiefly in the fact that it increases the worth of the land for grazing.

My reasons for this are:

(1) The main value of the Mamani forest at this elevation, on the leeward side of Mauna Kea, is from its being a source of posts and fuel and because it affords protection for stock, on a dry and exposed range. This value is sufficiently great to cause any intelligent stockman to take a lively interest in perpetuating the forest.

(2) The porous nature of the soil on this slope of Mauna Kea makes running streams out of the question. There is, therefore, no call for a protection forest.

(3) Unless the land on which the Mamani grows is subjected to heavy over-stocking with cattle, the trees appear not to be affected, nor is the reproduction seriously interfered with. With sheep the damage is greater. On the land in question the limited water supply practically insures against over-stocking. If, therefore, only cattle and horses are grazed, there is little to fear for the Mamani. And, as has been stated above, the land is said not to be suited for sheep grazing.

(4) The possible influence on precipitation of the Mamani

forest on this land may, I think, be neglected, especially as the existing cover is not likely to be much altered.

Higher up on the slope of Mauna Kea, above the existing forest and far above any good grazing land, is a region which is now of no real value to any one, but which I believe could some time be profitably planted with pines, spruces, firs, or other temperate zone timber trees. Before such work is undertaken many experiments as to kinds of trees and as to methods must be tried, so that it will be some time before any extensive planting could be done. But this high-lying land both on Mauna Kea and on Mauna Loa should, I think, be held out from all new leases, as waste land. And if, in later years, it is found that it can be made to grow forests, it should then be so used. To exclude land of this sort will work no hardship on any one now, and it may, later, be of distinct advantage to the Government.

In keeping with the general forest policy of the Administration and in view of the possible future use of the upper slopes for forest, I advise that a fencing clause be inserted in the lease of Kaohe 4, providing that a fence be built and maintained across the mauka portion of the area leased. I further suggest that it be stipulated that this fence be completed within five years from the date of the lease. As the lessee would in any event probably fence on or below his mauka boundary, such a clause could not be considered a hardship.

In view of the above, I recommend that the Committee report favorably to the Board on the question of leasing for grazing the part of Kaohe 4 desired, with the suggestion that a fencing clause be included. Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

NAKULA, KAUPŌ, MAUI.

Honolulu, T. H., April 19, 1905.
Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I have the honor to submit the following report upon the land of Nakula, Kaupō, Maui, in response to a request

from the Commissioner of Public Lands, referred to me on March 22, 1905.

The question before the Board in regard to this land is whether or not the Government's portion of Nakula is needed for forest purposes. On March 14, an application for a 21 year grazing lease of Nakula mauka was received by the Land Office, calling for "all that land lying mauka of Gt. 2743 Needham and Cook, and also mauka of that portion of Nakula leased to Captain Clarke, up to the seven thousand foot elevation and containing ~~one~~ thousand acres, more or less."

On March 28, the Commissioner of Public Lands informed the Board that the application had been amended to read "all the land makai of the (5000) five thousand foot elevation, and containing (600) six hundred acres, more or less."

I have not personally visited the land of Nakula, but from a general knowledge of that portion of Maui, reinforced by information obtained from a number of trustworthy persons, I believe I may safely make the recommendations which follow.

The southern slope of Mt. Haleakala in the district of Kaupo, and especially in that of Kahikinui, is of much more recent origin than any other portion of Maui and contains much extremely rough lava, similar in character to that in the districts of South Kona and Kau on Hawaii.

Taken as a whole, this section has not had a forest cover in recent times, if indeed it ever had. Scattering groves and groups of trees are found, but it is said by those who know the locality that even this sort of forest is less in evidence than it was twenty years ago. This forest has gradually disappeared in the same way as has the denser forest which formerly covered the Kula slope.

From the porous character of its rock and soil this section of Maui is without running streams. At best an area of scant precipitation, what water falls is quickly swallowed up and lost for economic use.

The chief, almost the only use to which the lands in this section can be profitably put is grazing. And even so, much of the land is too rough for anything but the poorest pasture.

Some of this poorer grazing land could undoubtedly be made to grow trees of economic importance and if it were planted it would probably yield better returns from its forest products than

could be got from its use for any other purpose. This is especially true of the belt lying above the elevation of from 5000 to 6000 feet, for it is at this elevation, above the limit of the native Hawaiian forest, that the valuable coniferous trees from the temperate zones—pines, spruces and firs—can be made to grow.

From the above statement it will be seen that the forest problem in Kahikinui and Eastern Kaupo practically narrows down to the question of ultimate planting. With hardly any existing forest to be maintained, and with surface conditions which make watershed protection unnecessary, it appears (1) that the part of the land of Nakula for which the Commissioner of Public Lands asks suggestions is not now properly to be classed as forest land, and (2) that the portion which seemingly is most suited for afforestation is excluded from the area proposed to be leased.

I therefore recommend (1) that the Board inform the Commissioner of Public Lands that it sees no objection to leasing for grazing purposes, the land of Nakula mauka below the 5000 foot contour line; (2) that the Board suggests to the Commissioner of Public Lands that the portion of Nakula mauka above this section ought to remain in Government control until such time as some now unforeseen use for it arises or until funds are available for planting it with forest trees. This latter recommendation is in line with the policy of the Board in desiring that the so-called waste land above the area of good grazing land on the higher mountains in the Territory be held by the Government against some future development, rather than that it be thrown in, as a sort of "manuahi," when the better lands below are leased.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

OPIHIHALE, SOUTH KONA, HAWAII.

Honolulu, T. H., April 5, 1905.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—On March 22nd you referred to me a letter from Mr. J. W. Pratt, Commissioner of Public Lands, dated February 13, 1905, in which he requests the opinion of the Board upon the land of Opihihale, South Kona, Hawaii.

I have the honor to submit the following report upon this land:

Opihihale is situated in about the center of what may properly be called South Kona. It is, with its sub-divisions, a land about two miles in width, which stretches from the sea well up onto the slope of Mauna Loa.

The part now owned by the Government is bounded on the north by Olelomoano 1; on the east, or mauka side, by Kahuku; on the south by Kaapuna; and on the west, or makai side, by the Opihihale Homesteads.

It appears on the official map of Hawaii as the largest of the areas marked "Government Tract."

The Government's part of Opihihale is some two miles broad by about five miles long, from the homesteads up the slope to the Kahuku boundary. It contains approximately 6,400 acres. A strip at the lower end, just above the homesteads, was partially cleared some years ago for an Awa plantation, now abandoned. This clearing is being gradually pushed mauka by cattle belonging to the homesteaders and others. The remainder of the tract is in forest.

The forest on Opihihale consists mainly of Ohia Lehua (*Metrosideros polymorpha*), in mixture with some smaller trees of minor importance, such as Koolea (*Myrsine lessertiana*), Kopiko (*Straussia hawaiiensis*), Pua (*Olea sandwicensis*), and Mamake (*Pipturus albidus*), with a dense undergrowth of tree ferns (*Cibotium*), Amau, Akolea, and other ferns and low shrubs and climbing vines like the Ieie, (*Freycinetia arnotti*) and the Uluhi (*Gleichenia dichotoma*).

The Ohia forms the major part of the forest and in many places the trees attain good height and fairly large diameter.

The Ohia forest extends up to an elevation of about 4,000 feet. Above that the character of the forest changes, the Ohia being replaced by Koa (*Acacia koa*) in fairly pure stand, with less undergrowth. The Koa occurs in groves more or less connected, rather than as a dense forest cover. Near the Kahuku boundary it is found in mixture with Mamani (*Sophora chrysophylla*). This mixed forest of Koa and Mamani extends some distance further up the mountain into the land of Kahuku.

The upper part of Opihihale is much rougher than that lower down, but nevertheless there are many pockets and little islands of good soil in the lava in which the Koa develops well and

reaches good size. Where the soil is scant the trees are short and spreading.

Although in common with other lands in South Kona Opihihale has much waste area, rough a-a or clinkers with little or no soil, yet taken as a whole the soil on this land seems to be deeper and of better quality than on certain other lands in the neighborhood, notably Kipahoe. Like the rest of South Kona the good soil occurs in various sized openings in the old lava flows.

The forest on the lower part of Opihihale is not now of much commercial value and from its character it is probable that at present and for some time to come the most profitable use to which this part of the land can be put is grazing. Grazing will naturally result in the clearing of the land. This, I believe, would be an advantage on the portion above and adjoining the homesteads, because from its soil and situation this land could ultimately be used for certain of the crops that come under the general head of "diversified industries."

In the Koa belt, on the other hand, the value of the forest is greater than the returns which could be got were the land used for other purposes. This part of the tract is not suited for agriculture, being too far from the road besides being much more rough and rock than is the land below. It is at best only inferior grazing land. This portion of Opihihale can, however, be made to produce trees. With the increasing value of Koa, as a merchantable timber, it is desirable that the Government retain such land as this for forest purposes.

For these reasons I recommend that the portion of Opihihale lying above (i. e., to the east of) a line drawn due north from the Triangulation Station on the land of Kaapuna, known as Puu Ahinui, be reserved for sale or lease and be set apart as a forest reserve. The elevation of Puu Ahinui is 3,967.8 feet, which would make the proposed boundary at an elevation of approximately 4,000 feet across Opihihale. The portion below the line should, I think, be leased.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

OLAA REMNANT, PUNA, HAWAII.

Honolulu, T. H., April 7, 1905.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry.

Honolulu, T. H.

Gentlemen:—On March 22 you referred to me a letter from Mr. J. W. Pratt, Commissioner of Public Lands, under the date of February 10, requesting the suggestions of the Board in regard to certain lands on the Island of Hawaii.

Three of the four tracts mentioned are in Hamakua. These I expect to visit during my next trip to Hawaii, after which I shall be ready to report upon them.

The other land called for I have the honor to report upon herewith. It is "that tract of land constituting the remnant of Olaa, below the surveyed part of Olaa New Tract, and between Keaau and Waiakea, forming a long narrow triangle and marked on the map of Hawaii as "Government Tract." The lower point of the tract comes practically to the Volcano Road, not far above the seven mile post. The upper end of the Remnant adjoins Lots 229 to 232 of the Olaa New Tract, at an elevation of about 1,600 feet.

While I have not made a personal examination of this tract I am familiar with the general character of the section from visits made to the adjoining lands.

This knowledge, with additional information concerning the tract obtained from Government officials and other trustworthy sources, is the basis on which I make the following report and recommendations.

The greater part, if not the whole, of the Olaa Remnant is covered by old a-a lava, known as the Kukulu Flow. It is this flow which the Volcano Road crosses between the four and eight mile marks.

The Kukulu Flow consists of large rocks, covered in part by good soil, but the surface is too rough to admit of plowing or cultivation. The upper part of the Remnant is shown on the map of the Olaa Lots, compiled by Mr. E. D. Baldwin in 1899.

Covering the entire Olaa Remnant is a dense forest of the same character as that on the remainder of the Olaa Tract. Ohia Lehua is the predominant tree, with a heavy undergrowth of

tree and other ferns, climbing vines and the tangle of tropical vegetation that goes to make up the native Hawaiian forest.

Were it possible to develop the Olaa Remnant for agricultural purposes there would be no objection to clearing and opening up the land for settlement. But as the land is too rough to be cultivated, about the only profitable use to which this tract could now be put would be the cutting and marketing of the Ohia trees for timber, ties or fuel. Whatever value the Olaa Remnant at present possesses is largely because of the forest thereon, and unless there is a decided change in the economic conditions its greatest value in the future will be that it can produce timber trees.

Provided an assured market for Ohia wood existed, there would be no impropriety in logging the Olaa Remnant, provided always that the work were done in such a way that the Government would receive a fair return from the wood cut and that the forest were left in good producing condition.

But if a revenue is to be derived from the sale of forest products from Government land, the Government itself and not some individual should receive the chief benefit. To this end, when Government forest land is to be lumbered a special form of contract should be entered into, containing such directions and regulations as to how the work shall be done as may be deemed necessary.

In the case of the Olaa Remnant it is difficult to say for what the land could be profitably used at this time unless the idea is to cut wood.

I, therefore, recommend that the Board of Commissioners of Agriculture and Forestry advise the Commissioner of Public Lands not to lease the Olaa Remnant or to let it pass out of the control of the Government, until the forest on the tract can be put on the market at a fair profit or until the local economic conditions are such that the land can be used to better advantage for purposes other than that of producing timber trees. Very respectfully yours,

RALPH S. HOSMER,
Superintendent of Forestry.

"CORRESPONDENCE."

Editor Forester and Agriculturist:

Referring to your comment on "the Araucarias" in the last number of the Hawaiian Forester and Agriculturist, I would say that the reason why *A. excelsa* does not produce fertile seed in Hawaii is probably due to the fact that this genus of coniferæ, is diæcious, and that male trees are isolated or entirely absent here, (which is easily possible because of there being altogether comparatively few specimens on Oahu), no pollen reaches the pistilate trees with the consequent non-fertilization of its ovules. As is well known to botanists, in order that pollination may take place among anemophilous plants, an enormous amount of very light pollen is produced so that wind-fertilization becomes possible even at great distances.

The writer has in mind a case in San Mateo county, California, (on the famous Flood estate), where a beautiful specimen of *A. Bidwellii* is quite regularly pollinated from a distance of a measured seven-eighths of a mile, the only staminate tree for miles around. Occasionally there is an off year for fertile seed, whenever there is rain or insufficient wind at the time when the pollen is ready for its flight, the necessary transfer cannot take place and infertile seed is the consequence. In like manner, our frequent showers may be responsible for the non-liberation of pollen at the proper time for perfect cross-fertilization. As the Editor says, it is regrettable that seed of this splendid class of trees is not procurable in the Islands so that they might more readily be propagated. However, seeds may be procured from the following reliable seed firms:

J. M. Thorburn & Co., New York.

Anderson & Co., Sydney.

Haage & Schmidt, Erfurt, Germany.

And possibly from Cox Seed Company, San Francisco, who catalogue young trees at from 60 cts. to \$3 each.

The writer would recommend the following varieties, giving preference in the order named:

Arancaria elegans (Norfolk Island Pine.)

A. Bidwellii (Bunya Bunya). A native of Southern Queensland. A handsome species attaining a large size in California.

A. Cunninghami (Moreton Bay Pine). Eastern Australia. Is

less formal and symmetrical than the above, but in California it makes a handsome specimen tree nevertheless. Von Mueller speaks of it as thriving on alluvial banks as well as on rugged mountains, "overtopping all other trees."

A. Cookii (*A. columnaris*, Hook.) A native of New Caledonia, where it forms large forests. Resembles *A. excelsia* somewhat in the disposal of its branches. The variety generally called *excelsa* in Honolulu, the writer believes to be this species.

A. imbricata and *A. Brosiliensis* are South American varieties likewise worthy a place in any extensive lawn. All do well in the milder parts of California, and should thrive in Hawaii.

Anyone possessing sufficient patience and a "knack" at plant propagation, may find it interesting and worth while to try their skill at rooting cuttings of the various *Araucarias*. The finest specimens are produced in this way, hundreds of thousands being annually so propagated in Ghent, Belgium, and exported to European and American centers.

Cuttings should be made from the tips of leading shoots, (ill formed side shoots produce unsymmetrical trees).

Medium fine sea sand, thoroughly washed, is best for "starting" the cuttings, which should be four or six inches long and inserted two-thirds their length in the shallow boxes of sand previously provided with drainage. Firm the sand well about the cuttings, water regularly once or twice daily, shade during midday and keep in as even and low temperature as possible. They should callus in a month or two and be sufficiently rooted in another month or two to permit of shifting to pots containing a light, well composed soil. Repot as often as the roots begin to fully permeate the soil, using the next larger size pot at each successive repotting, at the same time enriching and using heavier soil. *A. excelsia* is the easiest of all to handle.

The writer has propagated many hundreds in this way.

F. K.

The Forester has received a very cordial letter from Mr. H. P. Baker, Forester of the Experiment Station, Iowa State College of Agriculture and Mechanical Arts, which concludes as follows:

"We have under way a series of experiments, in co-operation with the U. S. Bureau of Forestry, in methods of treating soft wood fence posts, such as the willow, soft maple and

cottonwood. Various chemicals and oils are being used and we hope to find some method, both cheap and efficient, whereby the farmers of our State who use vast numbers of fence posts, can utilize the large amount of soft wood timbers now growing and thus, at a small expense, make these posts as long lived as the best grade of cedar posts. We shall, of course, use only those timbers which can be grown both easily and rapidly by the farmers of this and the surrounding prairie States. From 800 to 900 posts have been furnished by private parties throughout the State, who cut and peeled the posts last spring. We feel that the result of these experiments will be of very great interest to the people in the States who are confronted with the problem of the future supply of fence posts and cheap construction timbers."

THE VEGETABLE GARDEN.

By F. G. Krauss.

ROOT CROPS.

May.

The Carrot, Chickory, Parsnips, Ruta Bagas or Swedes, Salsify and Turnips.

The fundamental requirements of the several root crops being somewhat similar (with the exception of the Radish) they have been grouped together rather than assign their treatment to alphabetic order; and under Hawaiian conditions they are more or less adapted to all seasons' plantings—the present time being as good as any if water is available. Root crops are among the most wholesome and nutritious of garden vegetables and deserve a more extensive use for culinary purposes. In Europe, where it is practical to winter store, because of their exceptional keeping qualities, root crops form a large part of the vegetable diet. Carrots, Swedes (Ruta Bagas) and Turnips are also largely grown in Europe, and are being more and more appreciated in America for stock feeding, and while it is not believed such will ever be the

case here, carrots, at least, are worthy of trial for that purpose. They make a fine relish and conditioner for horses.

CARROT. *Daucus carota*.

F. *Carotte*. G. *Mohre, gelbrube*. P. *Cenoura*.

A sandy loam made rich by manuring the previous year, is perhaps best for this as well as for most root crops, although any good, deep soil, if thoroughly and deeply worked, will produce satisfactory results. While early plantings give best crops of carrots, they may be grown throughout the year, where water and suitable soil are available. For table use sow seeds of Denver's Half Long Orange, Chanteney, Guerande, or Ox Heart, and Early Scarlet Horn or Early French Forcing, the latter two being especially early to mature, and require little space for full development. Drills should be from 12 to 16 inches apart, according to variety. One fourth ounce will plant 100 feet of drill. For field culture sow in drills 18 to 24 inches apart, using from one and one-half to three pounds of seed to the acre. Cover one half to one inch deep and press the earth firmly above the seed. As soon as the plants appear use the hoe and cultivator freely to keep the soil mellow and free from weeds. Thin the small table sorts to two or three inches apart; the larger field varieties should be thinned to four or six inches apart and the thinned out plants fed. In this way two or three thinnings may profitably be made before maturity is reached. Improved Long Orange and Large White Belgian are the two sorts most extensively grown for stock feeding purposes. The former has done best at Kamehameha Farm. In California dairy regions the White Belgian is most extensively grown and on rich deep bottom lands it sometimes attains a weight of fifteen to eighteen pounds, and yields of thirty-five to forty-five tons per acre are not uncommon.

CHICORY. Large Rooted Chicory. *Cichorium Intybus*.

F. *Chicoree sauvage*. G. *Cichorie*. P. *Chicoria*.

Chicory is too little known as a vegetable. The French and Germans consider it a delicious table vegetable, either boiled or as a salad and the *bare-de-capucin* of the French and the *witloof* of the Germans is famous in Europe. It is produced from the blanched leaves forced in the dark from mature roots bedded in sand. The "Chicory" of commerce is the root sliced, dried, roasted and coarsely ground, and is well known to be largely used in the

adulteration of coffee, but its better uses make it well worthy of trial. It has done finely with us at Kamehameha, and if permitted to flower, its beautiful blue flowers add not a little to the artistic vegetable garden. A light, moist sedimentary soil, which is rich, permits of root expansion and development to the most perfect degree, but since such soils are the exception with us, any but the heavy clay and adobe soils of our wet lands may be made to yield good chickory plants by deep tillage and thorough after-cultivation to insure large smooth roots.

The "large rooted Magdeburg," with entire leaves of an upright growth, is best.

Seed should be sown as early as possible, in drills a foot to eighteen inches apart, and plants thinned to four or six inches apart. Sown thinly, a five-cent packet of seed will sow 50 to 100 feet of drill.

PARSNIPS. *Pastinaca Sativa*.

f. *Panais*. g. *Pastinake*. p. *Pastinaga*.

The Parsnip thrives best in cold climates,—in our warmer climate it lacks the fine flavor and crispness so highly prized in the perfect vegetable. We have grown some passable roots of the Improved Guernay and Long Smooth or Hollow Crown varieties. As with other root crops, a deep rich permeable soil and adequate moisture are necessary to produce tender well-formed roots. The seed germinates slowly and should be grown early in the season for best results. A half ounce will sow 100 feet of drill. Rows may be planted 12 to 18 inches apart and plants thinned to 6 inches apart in the row. Should any reader succeed beyond the writer's expectation, he is advised to plant extensively for stock-feeding; analysis and practical feeding experiments show that they are superior to carrots or Mangels for milch cows.

RUTA BAGAS or SWEDES. *Idem*.

f. *Choux-narrets*. G. *Kohlrube*. ITALIAN. *Corolo navone*.

These grown to a much larger size than the early varieties of turnips with which most of us are more familiar. It is a hardy root crop, especially adapted to the severest northern climates. The writer has seen none in the Honolulu market. We have grown the following varieties in an experimental way: Bread-

stone, Imp, Purple Top Yellow, and Twentieth Century, the former giving best results, but like the turnip, not well adapted to our conditions. In England and other European countries, the large stock-feeding sorts are largely grown and highly prized for winter feeding. For table use, sow as directed for turnips.

SALSIFY. *Tragopogon porrifolius*.

F. *Salsifis*. G. *Haferwurz*. P. *Cercif*.

While a perfectly hardy vegetable in cold climates, Salsify thrives under local climatic conditions, and should be given a trial in every garden where a deep, mellow soil is available, an essential condition for the best development of its long, slender roots. Salsify is sometimes called the vegetable oyster or oyster plant, and it is not difficult to imagine the oyster flavor when the roots are well cooked and seasoned. Here is Mrs. Rorer's receipt as adapted in the writer's home:

Boiled Salsify or Oyster Plant.—Wash and scrape one dozen medium sized roots of salsify, throw into cold water to prevent discoloration, as soon as scraped. Put into a kettle of boiling water, boil slowly about an hour. Drain, arrange on a plate of buttered toast; cover with cream sauce and serve hot.

Fried Salsify.—Boil as above; when done, drain, dust with salt, pepper, sugar, and flour. Put two tablespoonsful of drippings in a frying-pan; when hot, put in the salsify. Turn carefully until brown on all sides. Serve with baked or hot boiled ham.

But, as with rabbit, first "catch" your salsify, then cook it. It is not always procurable in the Honolulu market.

In the richest and most permeable soil in the garden, deeply prepared, lay out drills fifteen inches apart and sow best quality of seed at the rate of one ounce per 100 running feet, and when well established thin out to stand four to six inches apart in the row. Cultivate frequently during growth to keep soil loose and fine. Avoid fresh, rank manure, which causes the roots to grow unevenly. Dig only as used, as they discolor immediately on exposure to the air wherever bruised. Of the two varieties usually sold as the larger and stronger growing sort and less liable to branch than the Large White.

Salsify is a native of Southern Europe; the writer has been unable to ascertain how the name, Sandwich Island, has come to be applied to one sort.

TURNIP. *Brassica napus*.F. *Navet*. G. *Herbst-rube*. P. *Nabo*.

The common garden turnip, as with the Ruta-baga, does not well endure our warm, dry climate. However, it can be grown with some success, especially early in the season, when it is coolest and moist. We have obtained best results from sowing thickly either broadcast or in drills, twelve inches apart—then the leaves quickly shade the ground and keep it cool and moist, which encourages a rapid growth. When they once come to a standstill they become woody and bitter. Of the seven leading varieties grown by us, Early Flat Red, White Dutch and Ex. Early Purple Top Milan have done best. The Turnip, White Egg, sent out by the U. S. Dept. of Agriculture this spring, has done fairly well notwithstanding the unfavorable season. One ounce of seed will sow 150 feet of drill.

 MONTHLY LIST OF AGRICULTURAL PAPERS.

“Report of the Honolulu Park Commission to the Legislature of the Territory of Hawaii, Session of 1905, Honolulu, 1905.”

At a time when so much interest is being shown in extending our system of parks, this pamphlet is very acceptable. The membership of the Park Commission is set forth as follows:

A. S. Cleghorn, President.

L. A. Thurston, Secretary.

W. M. Giffard, Treasurer.

C. S. Holloway, ex-officio.

Messrs. F. M. Hatch, E. S. Cunha, and H. E. Cooper.

After a description of the business and jurisdiction of the Commission, the status of Kapiolani Park is given in the following terms:

“The report of the Superintendent of the Park, herewith, gives in detail the development and changes in Kapiolani Park during the past two years.

Kapiolani Park is situated on a site naturally sandy and swampy and in a climate so dry, that every operation necessary to create and maintain a public park is more expensive than the normal cost in and about Honolulu.

From its initiation until 1903, the foundation for a park, in the modern sense, was being laid. On that foundation, during the last two years, a beginning has been made in the creation of an up-to-date park. Such a park must include not only trees and drive ways, but lawns, ornamental shrubbery, flowers, waterways, grounds for games and sports, and should aim to ultimately provide for various exhibitions of an interesting and instructive character, such as animals, birds and collections of various kinds.

This community does not yet, as a whole, appreciate the value or necessity of parks as an agent of peace and civilization, as well as a profitable money investment by making them a part of a general scheme to make the city more beautiful and attractive, and thereby attracting not only tourists, but permanent desirable settlers.

With the exception of a few small squares in the city of Honolulu, Hawaii does not possess a single park reservation, excepting Kapiolani Park, and its development is not at all as advanced as it should be. Good progress has been made, however, during the past two years, the chief credit for which is due to Mr. Alexander Young, the Superintendent, whose professional knowledge and economical management have accomplished more than would have seemed possible two years ago.

The net results of the two years' work show that in addition to the current work of keeping the roads in repair and the Park in cleanly condition, and buildings and apparatus in repair, about 20 acres of land have been surfaced with soil, water laid on and grass planted thereon, and a fair beginning made at ornamentation with shrubs and flowers.

A good beginning has also been made at curbing the drive-ways.

The Park buildings have been placed in good condition, and will need no large outlay for a long time to come.

The roadways are in fair condition, but constant work is necessary to keep them so.

The unsightly stables and board fences which have for so long been an eye-sore in the center of the Park, have been removed.

A good nursery has been established, ample to furnish all necessary trees, not only for Kapiolani Park, but for all other public grounds in Honolulu.

With each additional acre of land placed under lawn or planted with flowers or shrubs, the current cost of keeping the Park in order increases. It must not therefore be thought that because considerable new work has been done during the past two years, the same proportionate development can take place during the coming period for the same amount of money.

The Commission beg to urge upon the Legislature the view that if we are to have a park at all, we should have a good one—one which we will not have to apologize for, and which will compare favorably with parks elsewhere. To accomplish this object we need more lawns and shrubbery and flowers; curbing to the driveways; a water supply that will make the water ways things of beauty, instead of miasmatic swamps. A children's play ground should be provided and a greater area made available for outdoor sports. This last mentioned point is particularly important, as there can be nothing more conducive to peace and order than healthy outdoor sports, participated in by the young men and boys of the community.

The Kapiolani Park lacks two main essentials to make its possibilities complete. It is on dead level ground, without hills, and has practically no sea front. Both are available without the expenditure of a dollar.

The Government owns Diamond Head. It is suitable for little else than park purposes. The Commission suggests the propriety of adding it to Kapiolani Park. Its slopes and cliffs can be made accessible by walks and roadways, and made to add greatly to the picturesqueness of the scenery and the beauty of the Park, while some of the surplus soil will prove very advantageous for filling where it is needed on the flats.

The Government still owns a number of beach front park lots.

The Commission urgently requests that these lots may be transferred to the Park. They are subject to leases, but if the fee is now secured for Park purposes, the danger of their being traded or sold off to private parties, will be removed, and the Park will ultimately be provided with a water front. Pending the lapse of the leases, arrangements may be made by which the public may obtain the use of the lots at an earlier date.

It is a standing reproach to Honolulu that its citizens have no access to the water front, from Diamond Head to Moanalua,

except from a street or wharf, without trespassing on private land."

Among the various ways in which the attractions of Kapiolani Park may be added to, the Commission suggests the following:

"For \$2,500 to \$5000 a very attractive and complete Aviary can be built, stocked and maintained. It could be built on a large enough scale to allow of small trees, shrubs and grass being enclosed and rockeries, miniature ponds, waterfalls and fountains constructed, amidst which birds of many varieties could live practically in a state of nature.

For \$2,500 a children's play ground can be graded and equipped with swings, and other similar apparatus, lawns, ball and croquet grounds, with adjacent shelter and other conveniences, with a monkey cage thrown in.

For \$5,000 to \$10,000 a most beautiful waterfall, rapids and fountain could be constructed near Makee Island, if the Legislature will provide an artesian well, which would at the same time flush the ponds and water ways."

Mr. Alexander Young, Superintendent of Kapiolani Park, submits an extensive report to the Commission, in which the following subjects are each severally noted:

Condition of the Park in 1902 and in 1905, Keeper's Lodge, Buildings, Stables, Lawns, Cleaning, Filling and Grading, Irrigating, Nursery, Tree and Shrub Planting, Roads, Walks, Curbing, Ponds and Waterfalls, Labor, The Jockey Club, Sports at the Park, and the Rapid Transit Company's Tracks and Lights. The concluding paragraphs of Mr. Young's report to the Commission are quoted in full:

"The band plays at Makee Island every Sunday afternoon, and also occasionally on moonlight nights; their presence being facilitated by the free transportation furnished them by the Rapid Transit Company.

The free band concerts constitute one of the chief attractions of the Park. Greater seating capacity should be furnished the audience at these concerts.

"Although the Aquarium does not now belong to the Park, the fact that it stands upon one of the so-called "Park Lots," and will eventually belong to the Park, if the Government consents, warrants reference thereto. It has been built during the past period, by Mr. and Mrs. C. M. Cooke, on land be-

was given for the purpose by Mr. James B. Castle. It is operated by the Rapid Transit Company, and contains about 1,000 fish of upwards of 100 different varieties. It is a most interesting exhibit and has added greatly to the attractions at the Park. It is free to the public on Thursdays, and its drawing character can be seen from the fact that more people visit the Park on that day than on any other day in the week except Sunday."

A statement of receipts and disbursements of the Treasurer concludes the report.

"Tobacco Experiments in Hamakua, Hawaii," by Jared G. Smith and C. R. Blacow. *Press Bulletin No. 12. Hawaii Agricultural Experiment Station. Honolulu, 1905, 24 pages.* The introduction to this publication is as follows:

"In the Autumn of 1903, a co-operative experiment was arranged under the joint auspices of the Territorial Board of Commissioners of Agriculture and Forestry and the Hawaii Agricultural Experiment Station, for the purpose of demonstrating the practicability of growing the best grades of cigar tobacco in Hawaii.

An examination of sites was made by Mr. F. E. Conter, a Special Agent, who, in the beginning had charge of the work. Mr. Conter visited the Puna, Hilo, Hamakua and Kona Districts of the island of Hawaii and finally selected a small tract on the Louisson Brothers' Plantation on the lands of Pohakea, Hamakua. A lease of 2 1-2 acres of the land was secured in the name of the Secretary of Agriculture, Washington D. C., at the nominal rental of Five Dollars per annum. Special privileges were granted by the owners of the land, who have assisted the enterprise in every way in their power. The land was new and uncultivated, so that a delay of some months ensued before the field could be made ready for planting. The first crop was transplanted to the experimental plots in March and April, 1904.

The experimental tobacco field was located in Hamakua because the physical character of the soil was right to produce a good quality of crop. The Pohakea Homestead lands were suitable, available and convenient. There are other areas in Puna, Kau, and Kona on Hawaii and on each of the other Islands of the group, but at the time this experiment was undertaken, the Po-

hakea tract was selected as the most convenient place in which to carry on field work."

A thorough description of the method of cultivating tobacco then follows, with a long account of harvesting and curing the crop. The Bulletin may be obtained free by application to J. G. Smith, Special Agent in Charge of the Experiment Station.

"Methods of Milking," by F. G. Krauss, *Instructor in Agriculture, Kamehameha Boys' School, Honolulu. Bulletin No. 8, Hawaii Agricultural Experiment Station. Washington, 1905.* The following comprises the introduction of this interesting publication:

"The matter of milking is not the least important of dairy operations, yet the fact remains that no part of the dairy work has hitherto received less careful and systematic investigation. In perhaps no other way can we account for the slovenly and ignorant manner in which much of the milking is usually done on the farm and even in large and otherwise well-managed dairies, where there is always difficulty in securing conscientious and skilled milkers. This is especially true in Hawaii, where the poorly trained Asiatic is so largely intrusted with the responsible care of the dairy cow.

It matters not how high the grade of the individuals comprising the dairy herd, or with what care they are housed and fed, careless or ignorant milking is sure to reduce the quantity and lower the quality of the milk and eventually ruin the milking qualities permanently, especially in the case of the heaviest milkers. It is even claimed by high authorities that the progeny of a fine milking strain may be seriously affected in their milking qualities for generations afterwards, no amount of after care being capable of repairing the damage done. This indicates strikingly one phase of the possible far-reaching effect of carelessness or ignorance in one branch of the manifold operations of the dairy.

On the other hand, careful, observant dairymen have profited by the knowledge that thorough "stripping" tends to stimulate and develop milk secretion, and therefore insist that their milkers "strip" clean. The strippings are much richer in fat than is the first mill drawn from the udder.

With this knowledge so general among dairymen, it seems a little strange that the facts have only recently been worked

over into a definite practical system, applicable in every well-regulated dairy.

The investigations here recorded are, with slight modifications, based upon the system of udder manipulation as worked out and advocated by the Danish veterinarian, Dr. J. Hegelund, of the Ladelund Dairy School, Denmark."

After a description of the experiments lately conducted at the Kamehameha Schools and a discussion of its results, the writer furnishes some valuable recommendations, and concludes with a description of the Hegelund method of milking, accompanied by five illustrations.

"The Extension of Rubber Cultivation," "Rubber on the Amazon"—the latter a synopsis of the results of Dr. Ule's expedition, on behalf of the Royal Botanic Museum at Berlin, to the Amazon valley, with the view of studying the botany of the rubber producing trees, the quality and yield of their product and a general investigation of the rubber industry of the country. *The Tropical Agriculturist*. Colombo, March, 1905.

"The Structure and Germination of the Cocoanut." *The Agricultural News*, Barbados, March, 1905.

"The Commercial Uses of Ramie," "The Plantain Fibre Industry." *The Indian Textile Journal*, Bombay, March, 1905.

"Dwarf Fruit Trees, Their Use, Propagation and Management," from an address by Professor F. A. Waugh, Horticulturist of the Massachusetts Agricultural College. *The Florida Agriculturist*, April 5, 1905.

THE REMOVAL OF SHADE TREES.

A bill entitled "An Act for the preservation of shade trees in towns" has lately passed into effect in an Eastern State. The bill, from which the following section is quoted, was apparently due to certain alleged unwise acts of the tree warden:

"No tree standing and growing within the limits of a public highway or town way in a town shall be cut and removed except by vote of the selectmen after public notice and a hearing. Whoever violates the provisions of this section shall forfeit not less than five nor more than fifty dollars to the use of the town."

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THE HAWAIIAN FORESTER AGRICULTURIST

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JUNE, 1905

No. 6.

A quiet yet earnest movement towards civic improvement has within the last few years manifested itself in Honolulu. The setting aside of two of the three public parks advocated in the Research Club's bill, may be regarded as among the first tangible results of an effort which it is believed is wider than any single organization. Much as has been accomplished by the declaration of park areas on Punchbowl Hill and Waikiki Beach, it is to be regretted that the proposed Tantalus reservation, after receiving the hearty indorsement of our citizens and the Senate, should have failed, by a narrow margin, to pass the House. The rejection of the Tantalus park measure, may to an extent, be due to a popular local misconception of the true meaning of the term "park." In its widest and proper application, a park implies a domain, generally of large extent, developed in such a manner as to enhance the natural beauties of the land and the vegetation which it supports. The proposed Tantalus reservation possesses in a remarkable degree those natural features which, under intelligent management, lend themselves best to the production of a beautiful landscape park. All that would at present have been required to render the area suitable for the purpose would have been the cutting of a few shady paths through the woods to afford access to the most picturesque parts. Few cities possess such an opportunity of securing an easily accessible mountain recreation ground at so slight a cost, and it is to be hoped that the land in question will yet be set aside for the desired purpose. The strong and increasing sentiment in favor of providing more and better parks for Honolulu, and the development among our citizens of a keener appreciation of their duty to secure a part of the beautiful environs of the city for public use, are matters.

for encouragement and congratulation. It is to be hoped that these manifestations of civic pride will not be content with the excellent work that has been done, but will continue to develop and increase. With the formative period in the history of our park system well under way, another step in the line of progress would be to secure the services of a competent municipal architect and landscape gardener, who would have supervision of the parks and ways of Honolulu, and would direct in the development of a beautiful and artistic city. The duties of such an official should include among others, the protection of our trees from destruction at the hands of the ignorant and thoughtless, and the furnishing of assistance and advice to property owners for the improvement of the natural resources of their land to the best artistic advantage.

Mr. E. H. Edwards' article on the cultivation of vanilla contains in brief space considerable valuable information upon an industry which promises before long to become an important one in this Territory. It seems unfortunate that the act lately passed by the Legislature to encourage the development of diversified industries, by the exemption of all property actually used in the production of certain specified crops, should have been so limited in its application. Vanilla cultivation is surely as worthy state solicitude as is rubber or tobacco, although the selection of any particular industries for special favor appears somewhat invidious. A more liberal policy would have exempted from taxation for a specified time, land devoted to any agricultural industry not yet established. It would also appear to be advisable to extend the period of exemption in the case of such crops as rubber and cork oak, beyond that of those which yield a return in a much shorter time.

NEWS LAWS ON AGRICULTURE AND FORESTRY.

During the regular session of the Legislature of the Territory of Hawaii for 1905, seven bills having to do more or less directly with Agriculture and Forestry became law. Two of the new laws modify and amend Act 44 of the Session Laws of 1903 (Chapter 28, Revised Laws of Hawaii), the law creating the Territorial Board of Agriculture and Forestry. Two repeal statutes inconsistent with the amendment to Act 44, while the others introduce new matter.

Following is a list of the new Acts with their numbers and the objects for which they were passed:

Act 6 (House Bill No. 32), "To Encourage Diversified Industries.

Act 12 (Senate Bill No. 73), making special appropriation for the immediate use of the Board of Agriculture and Forestry for the extinguishment of forest fires in South Kona, Hawaii.

Act 65 (Senate Bill No. 41), amending Sections 6 and 8 of Act 44 of the Session Laws of 1903, in the matter of setting apart Forest Reserves and modifying existing Reserves.

Act 71 (House Bill No. 186), to provide for the protection from fire of forest lands within the Territory.

Act 80 (Senate Bill No. 114), entitled "An Act to repeal Chapter 36 of the Revised Laws of Hawaii."

Act 81 (Senate Bill No. 113), entitled "An Act to amend Chapter 36 of the Revised Laws of Hawaii relating to diseases of animals."

Act 82 (Senate Bill No. 112), entitled "An Act to amend Sections 378, 388 and 390 of Chapter 28 of the Revised Laws of Hawaii relating to the Board of Agriculture and Forestry, and adding to said Chapter 28 seven new Sections, to be known as Sections 390 A, 390 B, 390 C, 390 D, 390 E, 390 F, 390 G.

Although perhaps not strictly pertinent, mention may also be made of Act 103 (Senate Bill No. 6) by which Punchbowl Hill and a part of the Beach at Waikiki are set apart as Public Parks. This Act passed in the closing hours of the Session, and was signed by Governor Carter only a few mo-

ments before the Legislature adjourned, being the last bill to become law.

Several of the laws enumerated above require appropriations before they can become operative. Consideration of them may therefore be postponed until the passage of the appropriation bills now before the Legislature, at its extra session. They will be discussed in a later number.

Of the other new laws, Act 65 is perhaps of the most interest to the readers of this magazine. The object of this Act is to make possible changes of boundary and reductions of area in Forest Reserves without the legislative action made mandatory by Act 44 of the Laws of 1903.

While it is not at all the policy or intention of the Board of Agriculture and Forestry to include in the forest reserves land which is adapted for agriculture, there are nevertheless certain sections in which it may for a time, be found best to maintain a forest cover upon land which, with changed economic conditions, might be used for agricultural purposes. The new law makes it possible to take advantage of such a change of conditions without the necessity of an appeal to the Legislature.

A case in point is the Hilo District on the Island of Hawaii. Above the line of profitable sugar-cane production is a belt which is undoubtedly suited to the growing of crops of various sorts. But until transportation conditions are materially improved, the development of this land is financially impracticable. As the existing industries are largely benefited by the protection afforded the water sheds by the present forest cover, it is believed by the Board that for the present the best interests of the community as a whole will be served by holding part of this land as a forest reserve.

As the fundamental idea of all the forestry work in the islands is to build up, increase and maintain the prosperity of the whole Territory, improvements in the law which will make it serve its purpose the better are to be welcomed. If by changing the law, new conditions can be more easily met and better dealt with, the change is an improvement. Just how the amended law will work in this case cannot of course be predicted, but it is believed that taken at large, the more liberal provisions of the new law will be a benefit rather than a hindrance to the cause of forestry in Hawaii.

ACT 6.

An Act to Encourage Diversified Industries.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. For five years from and after January first, 1906, all property, real and personal, actually used in the production of tobacco, rubber, cork oak, manila hemp, sansaveria salonica hemp and cacao for commercial purposes, shall be exempt from taxation.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 18th day of March, A. D. 1905.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 65.

An Act Amending Sections 379 and 381 of the Revised Laws of Hawaii Providing for the Encouragement and Protection of Agriculture, Horticulture and Forestry.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 379 of the Revised Laws of Hawaii is hereby amended so as to read as follows:

"Section 379. The Governor may, with the approval of a majority of the Board, after a hearing or hearings as herein-after provided, from time to time set apart any Government land or lands not then under lease or on which there is a lease of two years or less, as forest reservations. Any land or lands while so set apart shall not be leased or sold by the Government or used in any way for any purpose inconsistent with this Act; provided, however, that the Governor may from time to time, with the approval of the Commissioner of Public Lands after a hearing or hearings as hereinafter provided, revoke, modify or suspend any and all the orders and proclamations or any part thereof, which set apart such lands."

Section 2. Section 381 of the Revised Laws of Hawaii is hereby amended so as to read as follows:

"Section 381. Before setting apart any Government lands under this Act or before revoking, modifying or suspending

any orders and proclamations or any part thereof which set apart such lands as forest reservations, the Governor shall give not less than fourteen days' notice, by advertisement in not less than two newspapers, published in this Territory, of his intention to consider either the setting apart of Government land for forestry reservations under this Act, or the revoking, modifying or suspending of any orders and proclamations or any part thereof which set apart such lands, as the case may be; which notice or notices shall contain the name or names of the Island or Islands and of the district or districts in which said land or lands are located, and shall further appoint a time or times, place or places for hearing evidence and arguments either for or against the setting apart of said proposed forest reservations or the revoking, modifying and suspending any forest reservation heretofore made under this Act."

Section 3. This Act shall take effect from and after the date of its approval.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 71.

An Act To Provide for the Protection of Forest Land Within the Territory from Fire.

Be it Enacted by the Legislature of the Territory of Hawaii:

FOREST FIRE SERVICE.

Section 1. It shall be the duty of the Board of Commissioners of Agriculture and Forestry to take measure for the prevention, control and extinguishment of forest fires within the Territory.

CHIEF FIRE WARDEN.

Section 2. The Superintendent of Forestry shall be ex-officio Chief Fire Warden. The Chief Fire Warden shall have charge of all the Fire Wardens of the Territory, and shall aid and direct them in their duties.

DISTRICT FIRE WARDENS.

Section 3. The Board of Commissioners of Agriculture and Forestry shall appoint in such number and localities as it deems wise, persons to act as District Fire Wardens. They shall promptly report to the Chief Fire Warden all fires in their respective district and take immediate and active steps toward their extinguishment, assist in apprehending offenders against this Act, and give all possible assistance to the Chief Fire Warden. For all services in extinguishing fires and in apprehending offenders, payment shall be made by the Territory, at the rate of twenty-five cents per hour for the time actually employed, provided that payment for such services shall not in any case exceed one hundred dollars to any one person for any one year.

POWERS OF FIRE WARDENS AND ASSISTANCE OF PERSONS IN FIGHTING FIRE.

Section 4. All Fire Wardens shall have authority to employ all able bodied male persons, between the ages of 16 and 50 years, in the district in which they act, for assistance in putting out fire.

Compensation for services in fighting fire shall be at such rate for the time actually employed as the District Fire Warden shall fix.

The Fire Warden in charge shall submit time record and bill of the men employed, to the Chief Fire Warden, who shall examine and, if he approves it, shall forward the bill at once to the Auditor.

The District Fire Wardens shall have power to incur expense for the transportation and other unavoidable expenses of fire fighters, and shall include the same, with necessary vouchers, in their accounts.

SETTING FIRES.

Section 5. Every person who wilfully, maliciously or negligently sets on fire or causes or procures to be set on fire any woods, brush, prairies, grass, grain or stubble on any lands not owned, leased or controlled by him; and every person who wilfully, maliciously or negligently allows a fire to escape from

land owned, leased or controlled by him whereby any property of another is injured or destroyed; and every person who accidentally sets or causes to be set any fire on land not owned, leased or controlled by him, or sets or causes to be set any fire on land owned, leased or controlled by him, which spreads to the land of another, and allows said fire to escape from his control without using every effort to extinguish it, shall be deemed guilty of a misdemeanor and liable to a fine of not less than twenty-five dollars nor more than five thousand dollars. Setting such fires or causing or procuring them to be set or allowing them to escape shall be prima facie proof of wilfulness, malice or negligence under this section; provided that nothing herein contained shall apply to a person who, in good faith, sets a back fire to check a fire already burning.

FIRES TO CLEAR LAND.

Section 6. In times and localities of particular fire danger, the Chief Fire Warden may cause a warning to be issued that during a specified time fires to clear land, including the burning of fallows, stumps, logs, brush, dry grass or fallen timber, shall not be started, unless the written permission of the District Fire Warden of the District in which the fire is set has been first obtained. Such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out.

Section 7. This Act shall take effect from and after the date of its approval.

Approved this 26th day of April, A. D. 1905.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 80.

An Act to Repeal Chapter 36 of the Revised Laws of Hawaii
Relating to Diseases of Sheep.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 455 to 458 both inclusive of the Revised Laws of Hawaii are hereby repealed.

Section 2. This Act shall take effect from and after the date of its publication.

Approved this 26th day of April, A. D. 1905.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 81.

An Act to Amend Chapter 35 of the Revised Laws of Hawaii
Relating to Diseases of Animals.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Sections 440, 441, 443, 448, 450, 451, 452, 453, and 454 of the Revised Laws of Hawaii are hereby repealed.

Section 2. Section 446 of the Revised Laws of Hawaii is hereby amended by striking out of line 1 thereof the word "imported."

Section 3. Section 447 of the Revised Laws of Hawaii is hereby amended by striking out the words "executive inspector or" after "nearest" in line 2 and the words "or distemper" after "disease" in line 5.

Section 4. This Act shall take effect from and after the date of its publication.

Approved this 26th day of April, A. D. 1905.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 82.

An Act to Amend Sections 378, 288 and 390 of Chapter 28 of the Revised Laws of Hawaii Relating to Board of Agriculture and Forestry, and Adding to Said Chapter 28 Seven New Sections to be Known as Sections 390A, 390B, 390C, 390D, 390E, 390F, and 390G.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Section 378 of the Revised Laws of Hawaii is hereby amended by inserting after the word "value" in line 4.

thereof, the following: "and in the investigation, suppression and eradication of contagious, infectious and communicable diseases among domestic animals."

Section 2. Section 388 of the Revised Laws of Hawaii is hereby amended by inserting the words "or animals" after the words "Articles" in lines 6, 9, 11 and 12 thereof.

Section 3. Section 390 of the Revised Laws of Hawaii is hereby amended by inserting the words "or animal" after the word "article" in lines 3 and 5 and the words "or animals" after the word "articles" in line 7.

Section 4. Chapter 28 of the Revised Laws of Hawaii is hereby amended by adding seven new Sections thereto to be known as Sections 390A, 390B, 390C, 390D, 390E, 390F and 390G, and to read as follows:

"Section 390A. It shall be the duty of the Board of Agriculture and Forestry to gather, compile, tabulate, furnish and publish from time to time information and statistics concerning domestic animals in the Territory of Hawaii, their protection and use, to inquire into and report upon the causes of contagious, infectious and communicable diseases among them, and the means for the prevention, suppression and cure of the same.

Section 390B. Said Board of Agriculture and Forestry shall have power and authority to make rules and regulations, and to amend the same from time to time in its discretion, subject to the approval of the Governor for and concerning the inspection, quarantine, disinfection or destruction, either upon introduction into the Territory, or at any time or place within the Territory, of animals and the premises and effects used in connection with such animals. Included therein may be rules and regulations governing the transportation of animals between the different Islands of the Territory and along the highways thereof.

And also to prohibit the importation into the Territory from any foreign country or other ports of the United States or from one Island within the Territory to another Island therein, or to one locality from another locality on the same Island, of animals known to be infected with a contagious, infectious or communicable disease or known to have been exposed to any such disease.

All rules and regulations made as aforesaid shall have the force and effect of law.

Section 390 C. Said Board of Agriculture and Forestry shall have power and authority to appoint a Superintendent of animal industry who shall be a competent veterinary surgeon and shall be known as the "Territorial Veterinarian."

He shall have charge, direction and control, (subject to the direction and control of the Board), of all matters relating to the inspection of animals and the prevention and eradication of contagious, infectious and communicable diseases among animals, and of all matters relating to animal industry mentioned in or coming within the scope of this Chapter, and such other matters as the Board shall from time to time direct. He shall be paid such salary as may be appropriated by the Legislature and shall enjoy all the powers, rights, privileges and immunities of an officer of the Board of Health.

Section 390 D. Said Board of Agriculture and Forestry shall have power and authority to appoint and commission one or more Live Stock Inspectors for each Judicial Circuit, and other employees as may be necessary for the proper carrying into effect of the provisions of this Chapter and may at its pleasure remove any Inspector or employee and to fix their compensation.

Section 390 E. No domestic animal shall be allowed to enter the Territory of Hawaii except after inspection by the Territorial Veterinarian or in his absence by a Live Stock Inspector, and a permit issued by such inspecting officer to the consignee or owner, provided, however, that no fees for inspection shall be charged, nor delays caused concerning the landing of any domestic animal for which a certificate of health has been issued as prescribed by an act of Congress approved February 2nd, 1903, and entitled "An Act to Enable the Secretary of Agriculture to more effectually suppress and prevent the spread of infectious and contagious diseases of live stock and for other purposes."

Section 390 F. The landing of any animal for the purpose of inspection or quarantine shall not be construed to be an entry into the Territory for any purpose whatsoever, except as herein provided, and if in the opinion of the inspecting officer it shall be necessary or proper to quarantine any such animal, he shall have authority so to do at the expense of the owner or consignee.

Section 390 G. The Board shall have the power to quarantine any domestic animal known to be affected with or to have been exposed to any contagious, infectious or communicable disease, and to destroy the same, when in the opinion of the Territorial Veterinarian, or in his absence, a duly qualified Veterinary Surgeon, such measure is necessary to prevent the spread of such disease, and to provide for the proper disposition of its hide and carcass; and to disinfect premises where any such disease may have existed.

Section 5. Any and all laws in conflict with this Act are hereby repealed.

Section 6. This Act shall take effect from and after the day of its publication.

Approved this 26th day of April, A. D. 1905.

G. R. CARTER,
Governor of the Territory of Hawaii.

ACT 103.

An Act to Declare Certain Lands as Public Parks.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section. The tracts of land hereinafter described are hereby declared to be public parks.

1. All that certain tract of land situated on Punchbowl Heights, bounded on the South and West by Prospect Street and its proposed extensions, on the North and East by Punchbowl Drive, as more fully described in C. S. F. and Map Number 1523 on file in the Government Survey Office, subject to existing leases, and excepting such portions thereof as are now the property of private parties, provided that the same be properly developed as a public park without unnecessary delay.

2. That certain tract of land at Waikiki known as lots 120, 121, 122, 123, 124, 125, 126, 127 and 128, and bounded on the East by Main Avenue, on the South by land of W. G. Irwin, on the West by the sea and on the North by land of the Estate of S. N. Castle as more fully described in Registered Map No. 1079 on file in the Government Survey Office, subject to the existing leases.

3. That certain tract of land situated at Waikiki, known as lots 135, 136, 137, 138 and 139, bounded on the East by Main Avenue, on the South by land of A. Gartenberg, on the West by the sea and on the North by the land of H. M. von Holt, more fully described in said Registered Map No. 1079 on file in the Government Survey Office, subject to existing leases.

Section 2. This Act shall become law from and after its approval.

Approved this 26th day of April, A. D. 1905.

G. R. CARTER,
Governor of the Territory of Hawaii.

THE CULTURE OF VANILLA IN HAWAII.

BY F. H. EDWARDS.

The following important data have been compiled by Mr. Edwards for our pages, in response to a request from "The Forester":

ALTITUDE. Anywhere between 800 and 2000 feet. Below 800 feet, I think the vines would suffer from drought; they may thrive above 2000 feet, but I have not yet tried any at that elevation.

CLIMATE. I consider the climate of Kona particularly well adapted to the culture. Its immunity from wind is much in its favor, and the rainfall, being usually evenly distributed throughout the year—with the exception of the months of December and January, which are generally dry—there is sufficient humidity in the atmosphere to insure constant and hardy growth. The dry winter months are instrumental in preparing the vines for blossom.

SOIL. This varies very much in this locality. I have tried the cultivation of the vanilla vine in most of the varieties, with equal success. This, in a measure, is accounted for, owing to the vine being of the orchid tribe; so that, the atmospheric conditions being favorable, it derives as much benefit—if not more—from the air as from the soil. The vine will grow and send down aerial roots and flourish without being put into any soil.

CULTIVATION. If to be planted in fern land the ferns should be cut down during the spring months and nothing done to the land until the February rains set in. It should then be lined and planted with supports for the vines. The lines should be eight feet apart, and the supports three feet apart in the rows.

CUTTINGS. Advisedly not less than three feet in length—may be planted at the same time as the supports. Growth of grass amongst the vines should be encouraged; it serves to keep the roots cool, and when cut and spread over them, makes a good mulch. An abandoned coffee estate—given the conditions mentioned above as regards altitude—would make an ideal vanillarie; the trees would furnish substantial supports, and there would be no necessity to wait for the land to sweeten, as is indispensable where ferns have to be dealt with. The vines will begin to shoot in about a month or six weeks after being planted, and the shoots make from half an inch to an inch a day. Some vines will blossom in the spring following that in which they had been planted, but it not advisable to fecundate the flowers, as a thus early production weakens the vine for future crops. Cuttings for extension can be taken twelve months after the vine has been planted.

YIELD. A conservative estimate, when the vines are in full bearing, is a quarter of a pound of prepared vanilla to each vine, though I have heard of 600 lbs. having been taken from an acre; and at the present time I have one vine that, judging from the blossoms now in spike, will give more than two pounds.

VALUE. The species I am growing is known as "*Vanilla Planifolia*," similar to that grown in Bourbon, which is now quoted in price lists as selling from \$6 to \$10 per lb. according to length and quality. So far as I am at present able to judge, the cost of production, etc., will be about \$2 per lb.

PLANT. The cost of this is, comparatively speaking, nominal. All that is necessary is: An enclosed shed, having shelves all around; trays, similar to that on which coffee is dried; blankets, and a cauldron in which to boil water.

The cultivation of vanilla on these Islands will, doubtless before long, occupy the attention of the capitalist; but, to my mind, there is no industry that can commend itself more favorably to the small farmer. From a small area he could obtain a competency, and the whole of the work be done by the members of

the family. The cutting of the grass is the heaviest part of the work when a vanillarie is once established; the rest is intellectual work, fitted for boys and girls.

Suitable land can be had in this district, either to lease or purchase, from five acres upwards.

Vanilla Park Estate, Napoopoo, Hawaii.

TESTING SEEDS.

All reliable seed houses test the seeds they offer for sale, as to germinating power. No gardener can afford to patronize any other kind. "Cheap" seeds are usually a very expensive investment to the grower. The government tests have, no doubt, done very much to make dealers more careful about getting stocks of pure seeds. The amount of mixed and adulterated grass seed that has been reported by the Department of Agriculture is not creditable to the seed trade. We have no doubt that in most cases it was due more to carelessness than to absolute dishonesty. Yet that makes it no better for the buyer, and the seller is bound to use every possible precaution to ensure his goods are just what he represents them to be. The dealers could use the same methods of detecting adulteration and mixture that are used by the government officials.

Yet the most careful dealers are sometimes imposed upon. Not one of them can grow all his own seeds. They must therefore be in a measure dependent upon the honesty of the grower who contracts to raise a crop of seeds for them. Occasionally they are cheated. One of the most reliable and careful seedsmen that we know of, sent out a lot of cabbage seed a few years ago that contained at least five or six distinct varieties. This was no doubt due to the carelessness of an employee, in the seed warehouse, who probably spilled some seeds of different kinds and then to save them dumped the whole lot into one bin, to be sent out as pure seed.

As we said before, buy only of reliable dealers. If a mistake occurs they will be anxious to rectify it as you are to have them to do so. Do not condemn any dealer until he has refused to make good an error for which he is responsible.—The Florida Agriculturist.

*A PARTIAL ACCOUNT OF INSECTS AFFECTING
TOBACCO IN HAWAII.*

BY D. L. VAN DINE,

Entomologist, United States Experiment Station, Honolulu.

(Continued from April Number, p. 98.)

THE TOBACCO HORN-WORM.

(The larva of *Phlegathontius quinquemaculata*=*Sphinx celeus*,¹ *Protoparce celeus*, *P. blackburni*, etc.)

(Order, *Lepidoptera*. Family, *Sphingidae* or hawkmoths.)

The larva of this Sphingid moth is one of the "horn-worms," so-named because of the peculiar ornamentation at the rear end of the body, and is one of two species of this group affecting tobacco. This horn-worm is commonly known in the United States as the Northern tobacco-worm, likewise as the tomato-worm, and is probably the best known representative of the larvæ of this family, since specimens can always be found wherever the principal food-plants, tomatoes, tobacco and potatoes, are growing throughout America.

The long cylindrical greenish worm, with its peculiar markings and sphinx-like appearance when at rest, the brown-colored pupa supplied with the handle-like tongue-case, uncovered at times from its earthen cell beneath the ground, and the huge moth with the broad wing expanse are easily recognizable in the accompanying figure.

The illustration of the larva brings to mind, no doubt, a common natural history object, more or less repulsive, and perhaps heretofore unassociated with the gorgeous moth shown above.

REMEDIES.

While the great size of these larvae makes it possible for a comparatively few individuals to work considerable damage, on the other hand, they are easily observed and can be kept below the "danger line" by hand picking them from the plants. Howard says:

¹Meyrick. Fauna Hawaiiensis. Vol. I, Part II, 1899, p. 193.

In ordinary seasons and in certain localities the tobacco crop will not suffer so severely that it cannot be protected by the ordinary process of hand picking, or "worming," as it is called. Most conservative tobacco planters send their hands through the fields to pick off the caterpillars and crush them, and rely upon no other remedial work.

Should the horn-worm prove too numerous and the practice of hand-picking too expensive, the plants must be sprayed with an arsenical poison, either Paris green or arsenate of lead. The application of Paris green has already been fully discussed.



Fig. 5. The Tobacco horn-worm, *Phleganthontius quinquemaculata*. a, adult moth; b, full-grown worm or larva; c, pupa. Natural size. (From Howard.)

From experiments conducted by Prof. Garman in Kentucky it appears that the young worms are more susceptible to the poison than the more fully matured ones. The plants should be watched for the appearance of the young worms, and if spraying is to be done at all, it should be done at this time. A mixture at the rate of one pound of Paris green to 125 to 160 gallons of water has been found sufficient if the worms are not over half-grown in size. During the eight or ten days preceding harvesting the crop, the tobacco plants should not be sprayed. This precaution will insure none of the poison remaining on the leaves.

Concerning the use of arsenate of lead against the horn-worm, Mr. Quaintance says:

Its advantages over Paris green are, that it is insoluble in water and hence can be used of any desired strength without burning or spotting the foliage; it is quite adhesive, and will remain on the foliage longer, thus obviating the more frequent sprayings or dustings necessary with Paris green; it is white in color, and is hence visible on the foliage and thus lessens the danger from poisoning.

Directions for preparing arsenate of lead are given on p. 14 of Bulletin No. 3 of this Station, which will be mailed to any person in the Territory on request. Arsenate of lead, already prepared for use, is now on the market, both as a dry powder and in paste form. One such preparation, in paste form, is for sale in Honolulu under the name of "Disparene."

Dr. Howard, under the subject of remedies for the horn-worm, emphasizes the necessity of removing all worms from the plants after or during cutting, for the reason that if this not done, the worms will continue feeding on the leaves in the barn.

THE JAPANESE ROSE-BEETLE.

(*Adoretus umbrosus*.)

Order, *Colcoptera* or beetles. Family, *Scarabacidae*.)

This destructive beetle, first known locally as the "rose-bug" and the "Japan-bug," made its appearance in and about Honolulu in the autumn of 1891. The pest attracted widespread attention throughout the Islands because of its vicious attack on the roses, which up to that time, since the early days of their introduction, had been luxuriant in growth and profuse in flowers. This insect is first recorded from the Islands in Insect Life, Vol. VI, p. 43. Prof. Koebele, in his reports as Entomologist to the Hawaiian Government for the biennial period ending 1897 and the year ending 1898, records the insect as generally distributed and abundant on the Islands of Oahu, Maui, Kauai and Hawaii. The beetle is, according to Koebele, presumably a Japanese introduction, having been brought to the Islands in the larval state in the soil about the roots of plants.

While the Japanese rose-beetle from the first showed a de-

cided preference for the rose, it has, however, gradually extended its range, which now includes a great variety of food-plants. Following the almost complete disappearance of the rose, the grape was severely attacked. So general did the feeding habits of the pest become that practically all dooryard and garden plants were to a greater or less extent injured. Among its food plants, Prof. Koebele records two field crops, taro and sugar-cane, and says regarding its food plants in Japan:

I met with the insect while collecting in the forests, where they fell in my umbrella quite frequently during the summer, around Yokohama, especially while beating for the various Coccinellidae on oak, alder and many other forest trees upon which they feed at night. Not in one instance did I see a specimen in a garden.

Since taro and sugar-cane have already been recorded as food plants, it is not entirely a new departure to discuss this pest, essentially an horticultural one, as feeding upon a field crop. The insect is night-flying and feeds only after nightfall, secreting itself during the day in the loose soil beneath its food plant, among rubbish on the ground or in crevices such as are found between the stem or trunk of a plant and the soil.

REMEDIES.

Hand-picking in the seed beds will free the seedlings from this pest in one or two nights. If thereafter the seed beds are protected by a covering after sundown, relief from further injury will be secured. A box frame with wire cloth across the top could be cheaply made for this purpose, easily handled and would last for several seasons.

The greatest injury to tobacco from the Japanese rose-beetle will doubtless occur in the field. As a rule this insect feeds on the more matured leaves of plants. The beetle may not prove to be a serious tobacco pest as it might possibly have invaded the experimental tobacco plot from neighboring plants where it had exhausted its primary food supply. Should the work of the pest become serious in the field, it can be controlled by an arsenical poison as for the flea-beetle, split-worm and horn-worm. Arsenate of lead (Disparene) has been used with success against this pest on roses and other ornamental plants. Regarding a remedy for the beetle on roses, Prof. Koebele says:

One ounce of Paris green mixed with four pounds of flour of sulphur, and dusted thickly over the rose and other affected plants, has so far proved one of the best remedies against that serious pest, the so-called rose bug, *Adoretus umbrosus*.¹

THE SO-CALLED PINEAPPLE DISEASE.

BY BYRON O. CLARK.

From a paper read before the annual meeting of the Farmers' Institute of Hawaii, Wahiawa, May 6, 1905.

The pineapple plants here shown (Fig. 1 and 2) are samples of plants occasionally seen in the plantations of the Islands and are spoken of as "diseased" plants, which from observations made during the past seven years, I think is erroneous. Such plants are recognized by their yellow foliage and a more or less portion of their leaves being dried up at their points or for the larger portion of their length, and by the immature fruit which they bear. The fact that the trouble does not seem to spread, and that affected plants can be restored to color and growth, as shown by observations and experiments made during the past two years, convince me that the trouble is a condition entirely local to the plant, and where any decay or fungus development is manifest it is of a secondary development, and not the original cause, which I have found to be a lack of nourishment caused by the loss of the root system following "strangle root," sour soil, and by flooding with storm water. (Causing the soil to bake about the plant when not well stirred after such flooding.)

I have dug up affected plants, cut off the affected stock above the old root system, trimmed and planted them in the same manner as young plants, with the result that they sent out new and healthy growth, even when replanted in the same place in which they formerly grew. I have also taken suckers from affected plants, showing the same conditions as the mother plants, that made good healthy plants. I do not believe such results could be obtained if there was any disease present.

¹Report of Entomologist. Biennial Report of the Minister of the Interior. Provisional Government of the Hawaiian Islands. 1894. p. 101.

"Strange root" (a very appropriate term, by the way) is the result of the encircling of the stock of the plant by the roots, caused by their growth inside the leaf shields of the stock, like the roots of a plant in a flower pot when "pot-bound." The plant here shown (Fig 3) is an object lesson better than any



FIG.—1.

words. The side of the stock has been cut through obliquely, showing how the circulation of sap is stopped by the expansive growth of the stock after being encircled while young. When this encircling of the roots does not take place till the stock has attained its maximum diameter no strangulation takes place, and

the plant will not suffer. Strangulation is generally prevented if the leaf shields are properly removed from the base of the sucker before planting, but with even this precaution, roots will sometimes form above where the leaves have been removed and strangle the plant.



FIG.—2.

It can be readily seen that with the flow of the sap so interfered with, or entirely cut off, as is the case with badly affected plants, the plant cannot survive. The roots decay from congestion, while the top prolongs its existence from what substance it

in absorb from the stock and the atmosphere, generally drying up.

Two years ago I prepared the plants for five acres of ground by slitting the leaf shields longitudinally above where they had

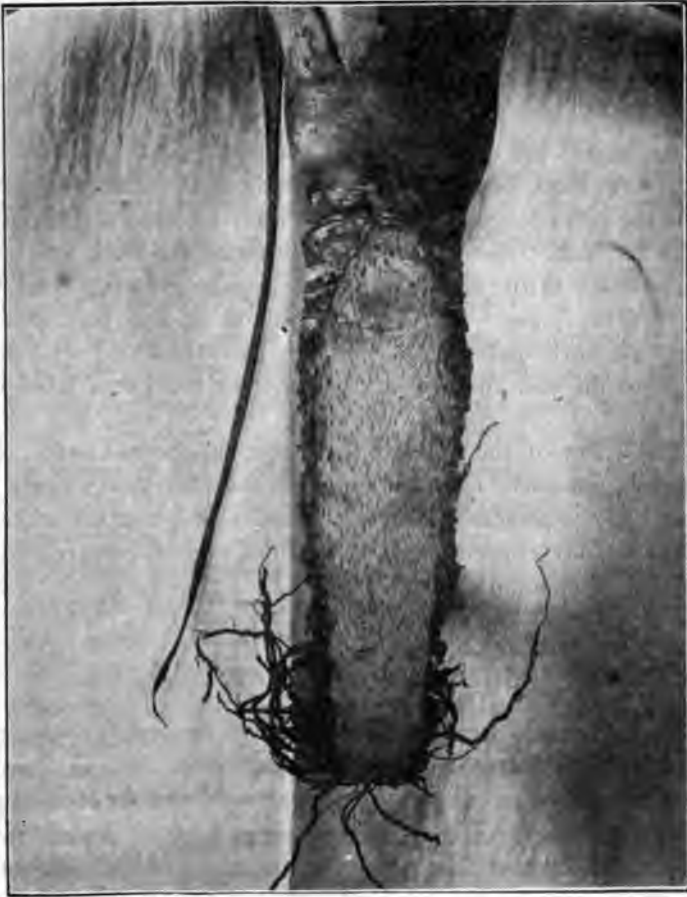


FIG.—3.

been stripped, so that there would be a chance for the roots to penetrate them. The results have been very satisfactory, scarcely any strangle root showing in this field, and what does can very safely be attributed to replants which were not so treated. This sucker was removed from the parent plant about a fort-

night ago, slitted quite deeply with none of the leaf shields removed, and planted immediately. As will be seen, the young roots have found their way out through the cuts to the soil, and no decay or other trouble is manifest from the deep cutting. That the slitting of the plant will prevent strangle root, I am quite certain of, and that there is not likely to be any appreciable loss from decay by exposing the young tissues of the sucker to the moist soil is shown by this small experiment; but on the latter point I will not express myself until I have experimented more extensively.

When plants are affected by acid soil or other cause that destroys their roots, banking up the soil about the stock will often enable the plant to get sufficient new roots into the soil for it to mature its fruit. The improved condition of the plant will soon be manifested in the color of the new foliage growing from the center of the plant. Banking up the soil is also beneficial to plants that have suckered too high for the ratoons to send their roots into the soil and will compensate for the extra labor expended.

While I am of the opinion that what has been known as a disease, is not such, I do not hold out the idea that we will be immune to the attacks of various enemies of pineapple culture. Such is not the experience of other lines of horticulture and is more than we should expect.

THE SEEDLESS APPLE.

If seedless apples were absolutely new to the fruit-grower, the matter would take on a different complexion; but as already pointed out by other writers on this subject, the seedless apple has been known for a couple of centuries back. Again, from what we can learn of this variety, it has no transcendent merits aside from scarcity of seed; and from the best information at hand, it can not even be called seedless, because many specimens examined have yielded seeds. If seeds are developed at all, then the core characteristics are certain to be present; and to my mind, these cartilaginous flakes which surround the seed cavities are the objectionable features. Are they not, after all, the things that make up the small boy's core?—T. Craig, "Western Fruit Grower."

THE VEGETABLE GARDEN.

BY F. G. KRAUSS.

JUNE.

The Maintenance of Soil Fertility.—

This is the season when many of us are preparing for our summer vacation, and likewise, if our vegetable gardens have yielded to their utmost, are they also entitled to a period of rest.

Indirectly, this rest period of the land may prove quite as profitable to the gardener as any stage in the annual gardening cycle. Cultivated soils become weary, and get out of humor when continually overworked, just as do persons. In the temperate zones, nature provides this needed rest during the winter months, but under our arid, semi-tropical conditions, the reverse is true. Plant life, while never quite dormant, becomes almost nearly so during the hottest and driest period of the year, and in the long run it is better to aid nature, rather than to force it; and at this season of the year we can be most helpful to the soil by letting nature take its course for a month or two. This is our uniform practice on Kamehameha Farm.

Rational soil management is the foundation of successful farming; yet until within comparative recent years, very little attention was given to this fundamental agricultural practice. But with the natural tilth and fertility of our soils declining, and the response from artificial fertilization and irrigation gradually becoming inadequate to the outlay, the agricultural experiment stations have set themselves to solving the problem of economic soil conservation.

At Kamehameha Farm we are fortunate in being enforced to leave part of our lands in idleness during June and July, because of the absence of our students, and the visitor to our garden would find but few tender annuals at this season. Some of the raised beds have already been leveled down, and piles of farm yard manure appear in their stead. As the last of the vegetables are harvested the compost is spread evenly, immediately plowed under, and the whole is allowed to remain in the rough for a much-needed rest. Should the summer rains continue, it will not be long before a fine carpeting of weeds will cover the newly-

plowed ground: this is nature's way of doing her share towards the revitalizing of the worn-out soil, and her efforts in this direction may be welcomed and encouraged. When in flower, if not too tall by that time, and before they go to seed, the weed crop may be plowed under, thus "green manuring" the land at little expense. The humus formed from this decaying vegetation is that life-giving substance which the highly organized, cultivated crops crave, and which no commercial fertilizer can wholly substitute for the production of a perfect development in tender, quick-growing vegetables. While it is true that green-manuring is not adapted to all soils, especially those already rich in organic matter, such as peaty swamp lands, most of our leeward districts are capable of great improvement by such treatment, as has been demonstrated by us repeatedly. Nor is there a cheaper source of the valuable food element, nitrogen, for those who can afford to let their land rest for several months than by means of legume crops plowed under. Of these we have found the cow-pea and velvet bean best suited to our conditions. Even strongly acid soils may be made to successfully grow these legumes by a previous treatment of lime. In reclaiming some rice and taro patches, three years ago, applications of 1,000 pounds and 2,000 pounds of lime per acre corrected the acidity and greatly improved the texture of the soil, so that the single application has made these soils among the most productive on Kanehameha Farm. On the other hand, similar lands, simply drained at this time, were two years later in coming into condition, and to this day cannot be made to grow a good crop of legumes, though repeated trials have been made for two years. This soil is naturally rich in organic matter and probably in nitrogen also, but not in an available form. Much is now being written about nitrogen bacteria to which the various legumes act as host, and it is their development we have in mind when we use leguminous plants for green manuring. This class of plants has the peculiar power of assimilating the atmospheric nitrogen through the action of the nitrifying bacteria which lodge in the nodules attached to the roots of the legumes; but even leguminous plants have not the power to extract nitrogen from the air unless they are provided with the proper nitrogen-gathering bacteria. The frequent failure of alfalfa in Hawaii may largely be due to such omission.

Of the practicability of artificial soil inoculation with nitrifying bacteria, there can be no doubt; while, on the other hand, many of the so-called "cultures" now on sale and extensively advertised, are doubtless humbugs. At all events, before attempting the inoculation of any soil, one should satisfy himself that the soil is sterile of the proper bacteria, whether the soil is naturally too wet or too acid, and if so, to first correct these adverse conditions by either drainage, liming, or extra tillage, or altogether. If the crop then fails, inoculation may be necessary, and to do this most economically and certainly, the writer recommends the liberal application of soil from an old alfalfa field known to be infested with an abundance of alfalfa root tubercles. Those of a more experimental turn of mind may send \$2.00 for a trial package of the 'wonderful new discovery,' "Nitro-culture" (discovered some fifteen years ago) to almost any enterprising seedsman, who will send the goods, postpaid.

The fundamental requirements for permanent maximum crop production are good tillage, rotation and reasonable rest for the land. Supplementary to this, artificial drainage and artificial fertilization may be necessary. If the latter, by all means let farm-yard manure be your first choice; try green-manuring, and at your last resort be the more expensive commercial fertilizers. In connection with all of these, and perhaps in combination, try liming your soil; but above all, give the air and sun a chance to do their part by deep and thorough tillage. In connection with these notes on soil treatment, "July notes" will deal with a lot of experiments with fertilizers as conducted on Kamehameha Farm, for the purpose of ascertaining what substances our soils are most in need of and in which form best applied. This practice of "putting the question to the soil," as adopted by a few advanced, practical agriculturists, is capable of even more reliable results than is usually obtained from the most careful chemical soil analysis, although in connection with each other, both methods are enhanced.

MONTHLY LIST OF AGRICULTURAL PAPERS.

The list of agricultural papers as published month by month was commenced in the January issue of this year, and it has been gratifying to find that it has been one of the most appreciated features of the Forester. During the last month no fewer than fourteen papers were requested from this office, many of them by the same applicants, all of whom will, as the magazines requested by them become available, be satisfied. It seems, however, hardly fair upon the publications we mention, that the Forester should make itself a gratuitous distributing center for such literature, and by passing to many readers its own copy cause one subscription to do the work of a great many. Our monthly list was originally published to bring to the attention of readers, who generally are not so situated as to have a wide agricultural literature available, such publication and papers as appeared during the month and bore some relation to local affairs. In every case care has been taken to give whatever information was known as to the price and address of publication, and a general offer has been made to assist to procure any magazine or paper mentioned in the list. This offer of our services has proved a frequent source of misunderstanding, for although not explicitly stated, it was never thought that help would be requisitioned until an ineffectual effort had been made to obtain a required magazine from the data supplied by the Forester. The work entailed in answering the requests for literature, none of which have been accompanied with postage, has so grown that we have reluctantly to discourage its further development. We shall continue for the present to print the monthly list, and whenever we are unable to give sufficient data for our readers to procure publications we shall be glad to forward our own copy for the perusal of any reader who encloses postage and promises its return.

"Forest and Ornamental Tree Seed for Sale at the Government Nursery," by Ralph S. Hosmer, *Superintendent of Forestry*. Press Bulletin No. 1, Division of Forestry, Board of Commissioners of Agriculture and Forestry, Territory of Hawaii. This pamphlet contains a list of tree and palm seeds for sale at the Nursery, with their price and approximate number per ounce. All communications in regard to seed should be addressed to Mr. David Haughs, Box 331, Honolulu, T. H.

"A Circular of Information," by Jacob Kotinsky, *Assistant Entomologist. Circular No. 1, Division of Entomology, Board of Commissioners of Agriculture and Forestry, Territory of Hawaii*. Written "with the object of drawing the attention of the people of this Territory to the work of this Division, in order to establish more intimate and frequent communication between the people suffering from insect injury and the workers in this Division from whom they may secure help." Furnished upon request of the Division of Entomology, Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

"Preparation of Fruit Pulp." ('Pulping is a useful method of preserving fruit intended for jam-making. It enables the fruit to be sent long distances and to be sold out of the season when the market is not overstocked.' The process might probably be applied with success to our extensive guava crops now wasted. The cost of preparing and exporting the pulp from Dijon, France, to London is estimated to be about \$2 per cwt. of 112 lbs. The cost of an installation for preparing about 60 cwt. per day is estimated in France to cost from \$600 to \$800.—Ed. F.) *The Journal of the Jamaica Agricultural Society*, Jamaica, April, 1905. 3 pence.

"Pisé and Adobe Buildings for Dwellings, Dairies and Store-rooms." (Pisé is 'rammed earth.'—Ed. F.) *Agricultural Gazette of New South Wales*, Sydney, April, 1905. 6 pence.

Les vignes à cultiver en pays tropicaux. (Species and varieties of the genus *vitis*, cultivated in the following countries: Ceylon, Java, India, Tonkin, Madagascar, Reunion, Jamaica, Florida and Brazil.—Ed. F.) By M. O. Labroy, *Journal d'Agriculture Tropicale*, April, 1905, 10 rue Delambre, Paris, France. 2 francs.

"Leaf-Hoppers and Their Natural Enemies, (Pt. I. Dryinidae)" by R. C. L. Perkins. Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association. *Division of Entomology. Bulletin No. 1. Part 1.* 80 pp. 69. Honolulu, H. T. May 27, 1905.

NOTICE.

By a resolution adopted at a recent meeting of the Board of Commissioners of Agriculture and Forestry, it was decided that the publications of the Board shall be divided into the following series:

- I. The Board itself shall issue:
 - A (Annual Reports);
 - B (Bulletin);
 - C (Circulars);
 - D (Press Bulletins).
- II. Each Division shall issue:
 - A (Bulletins);
 - B (Circulars);
 - C (Press Bulletins).

JOB'S TEARS.

The "Agricultural News" of Barbados lately published an extract from the "Agricultural Ledger" (India) on Job's Tears. An analysis was given as follows:

Proteids	18.81	per cent.
Fat	6. 2	" "
Soluble carbohydrates	59.55	" "
Fibre	1.28	" "
Ash	3. 4	" "
Water	10.74	" "
Energy value	378	calories.

which shows it to be a very nutritious food. It is used for human food in Assam and in parts of India, but there it is a cultivated variety. The grains of the wild kind such as we have growing here have an exceedingly hard, brittle shell, so much so that they are used for beads. At the same time this wild variety is not without its value. The green plant which grows luxuriantly in most valleys and along streams has a resemblance to Guinea corn and maize, and is eaten with great relish by stock, cows especially. In fact we ourselves have used this so much lately that it has occurred to us that while we attempt to introduce new fodders the claim of the Job's Tear plant as a green forage may be worth more consideration than it has got. It is not a dry land plant evidently, however, and it is more particularly drought-resisting forage plants that we wish to introduce and encourage. It would be interesting to see the analysis of

the green plant. When hard up for corn this year we ground Job's Tears in a mill and fed the result to poultry. The birds picked out the crushed kernels and left the hard shells. They seemed to get along fairly well on it. With the shells sifted out it was also used for large stock, but was not profitable because of the immense amount of grinding it took and the large amount of waste in the shells. The chemist is making analyses of the plants and seeds which will no doubt be published in due course. —Indian Planting and Gardening.

THE VALUE OF SEEDLESS FRUITS.

There has recently been considerable discussion over the merits or demerits of a seedless and much advertised apple that has been discovered in Colorado, U. S. A. It has been claimed for this apple that it will revolutionize the apple growing districts of the old and new worlds, its special points of merit being, (1) that the tree being almost blossomless there will be no risks from late frosts, (2) that the absence of seed will deprive the codlin moth caterpillar of this source of food, thus rendering this old standing pest harmless, (3) that the absence of a core will be of economic importance for evaporating and cooking purposes. The opinions of American and European orchardists are however by no means undivided on the subject, it being counterstated that the seedless apple is a sort of white elephant, lacking in qualities of flavor, size and prolificness, and that it is an old freak boomed again. The alleged bloomless character would certainly seem to give the case away; the idea arises from the fact that the characteristic petals of the apple flower are undeveloped, so that the claimed immunity from frost is a delusion.

However, it is possible that the evolution of a perfect seedless apple may in time be as complete as the seedless orange, which was once considered impracticable. It is doubtful whether there exist in the tropics so much as in temperate climes the conditions which lead to the production of seedless fruits.

The tendency to a seedless state is greater in certain classes

of plants than in others, according to their powers of spontaneous reproduction by vegetative means as by "suckers," "runners," "bulbils," etc. High cultivation is also an important factor in the matter, though in this respect less influence is exerted in the tropics than in temperate countries. We have familiar examples of the value of seedless fruits in the plantain or banana, breadfruit and the pineapple, in each of which cases the plants have taken to reproducing themselves by suckers. To these seedless limes have lately been added, and cases of seedless rambutans and mangosteens are not unknown locally. The discovery of perfect seedless mango fruits would doubtless be especially welcomed by many who regard this fruit as otherwise faultless, whilst seedless mangosteens with no loss of pulp flavor would to many people be even a greater boon.—H. F. Macmillan, Tropical Agriculturist.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. II.

JULY, 1905

No. 7.

EDITORIAL.

Under the title of Paternalism in Agriculture there appears on another page of this issue of the Forester, an interesting and suggestive paper, recently read before the Honolulu Social Science Club by Mr. William Alanson Bryan.

After briefly tracing the historical development of government assistance to Agriculture, particularly under conditions resembling our own, Mr. Bryan makes a strong plea for the establishment of diversified industries in this Territory, by means of state aid for experiment station work, and by bounties to new industries.

Following a eulogistic tribute to the men who have made the sugar industry of Hawaii what it is to-day, Mr. Bryan points out some of the dangers which beset the path of a country dependent upon a single industry, and in a lucid statement shows how the fortunes of Hawaii depend in large measure upon factors over which the people of these Islands have practically no control.

It is in no spirit of antagonism to the sugar interests, that this statement is made; the facts are plain and unvarnished and are those which confront every one who goes at all below the surface in his study of local conditions. With changes in the tariff, with the letting down of the bars to Cuba, with the not impossible extension of the influence of the United States over the Central American countries, there might result in Hawaii changes which would make the outlook anything but a hopeful one. The great natural laws that govern in the realm of political economy do not greatly concern themselves with any particular locality or with "peculiar conditions." Once set in

motion the shifting of economic conditions may go far before an equilibrium is reached.

To forestall the disastrous consequences, which would follow a serious alteration of the foundations on which our main industry rests, it behooves us to promote by every means in our power the establishment of other industries in this Territory; not in opposition to Sugar but as co-operating with it in a more complete development of the resources of Hawaii.

There are a number of products that can be grown in these Islands on land not suited to sugar-cane, which if rightly handled in the field and systematically and attractively put upon the market would bring the producer good returns.

There is room enough for both sugar and diversified industries, and it should be the pleasure as well as the duty of every thinking man in the Territory to help on the day when this fact is generally recognized.

The policy of federal and state assistance to agricultural investigations carried on by the departmental and experiment station specialists is one that receives cordial support in the United States and Hawaii has in the past borne its part in the good work.

Just how far it is wise to go in the matter of bounties is too large a question to be discussed here; it touches on too many disputed points of economics. But the general subject which the paper under discussion deals is one of prime importance to the people of this Territory. It is a subject which should be kept prominently in mind. Whether or not one agrees with the conclusions reached by Mr. Bryan as to the methods to be employed, particularly in the matter of bounties, there can be no question that Hawaii would have a larger share of true prosperity if it followed more closely the "corn and oil and wine theory." As provocative of thought and discussion of this important subject Mr. Bryan's contribution is timely and welcome.

R. S. H.

The attention of our readers is called to an extremely interesting contribution by Mr. F. G. Krauss on Agricultural Education which takes the place of his usual article in the series entitled "The Vegetable Garden for the Month."

The figure illustrating the Tobacco horn-worm in Mr. Van

Dine's article last month was wrongly described as "natural-size." The mistake arose in the preparation of the illustration which should not have been reduced from the drawing. The actual size of the insect represented is considerably larger than shown by the illustration. We are indebted to Mr. Van Dine for determining the insects present in Hawaii in the list which appears in this number.

An illustrated article on the Tannery lately established in Oahu has been omitted from this issue. It will appear next month.

THE HILO FOREST RESERVE.

It is with a feeling of no small satisfaction that we are able this month to chronicle the creation of the Hilo Forest Reserve on the Island of Hawaii.

Based upon reports and recommendations made by the Superintendent of Forestry and approved by the Committee on Forestry,* the Board of Commissioners of Agriculture and Forestry, at a meeting held on June 30, 1905, unanimously adopted the following resolution:

"RESOLVED, that the Forest Reserve in the Hilo District, lying between the 1881 Lava Flow, back of Hilo Town, and the Hamakua District line, in the Hilo District, Island of Hawaii, as recommended by the Committee on Forestry, based upon the reports of the Superintendent of Forestry, dated August 9th, 1904, October 14th, 1904, and June 28th, 1905, and on maps and a description of the boundary prepared by Mr. A. B. Loebenstein and by the Survey Office, now on file in the office of this Board, a copy of which description is hereto attached and forms a part of this resolution, be approved.

RESOLVED, that the Board recommends to the Governor that the Government lands within the boundaries of the Proposed Forest Reserve, be set apart by him after the hearing required by Law.

*These reports appeared in the October and November (1904) issues of the Forester, Vol. 1, pp. 275 to 282 and 313 to 318.

RESOLVED FURTHER, that the Board recommends to the Governor, that all the land within the said described boundaries be set apart as a Forest Reserve, subject to all private rights and titles, and that all owners of private lands lying within said boundaries be requested to co-operate with the Board of Agriculture and Forestry in reserving all of said lands for forestry purposes, in accordance with the terms of Chapter 28 of the Revised Laws of Hawaii."

On July 19, Acting Governor Atkinson and the Board of Commissioners of Agriculture and Forestry held the Public Hearing required by Law. No opposition to the Reserve developing, Acting Governor Atkinson declared the Hilo Forest Reserve to be created, and on July 24th, signed the formal proclamation, describing the boundaries and setting apart the unleased Government lands lying within them. The total area of the Reserve is 110,000 acres, more or less; the Government lands actually set apart 12,771 acres, more or less. The proclamation issued by Acting Governor Atkinson will appear in the August issue of the Forester.

It may perhaps be well to explain the relation of the lands set apart to the remainder of the area embraced within the limits of the Reserve. By officially recognizing the larger area the Governor and the Board of Agriculture and Forestry go on record as to the section which they believe it is to the advantage of the Territory to devote to forest purposes. The Government then shows its good faith by setting apart the unleased Government lands lying within the limits of the Reserve and requests private owners to follow its example and co-operate under the Law to carry out the plan and secure the objects for which the Reserve is made.

In the case of the Hilo Forest Reserve, from one third to one half of the land within the boundaries is owned by private individuals or corporations. The remainder is Government land, for the most part under lease. The Government sets aside at this time the two Government lands not now under lease, viz: the mauka portion of Honomu, 926 acres, more or less, and the section above Laupahoehoe known as the Papaaloa Forest, 11,845 acres, more or less. As the leases on other Government lands run out the Board of Agriculture and Forestry will recommend that the portions within the Reserve be also set apart.

Except as the owners of private land or the lessees of Government land co-operate with the Board of Agriculture and Forestry as provided by Law, the Government can exercise no authority over the other lands within the Reserve boundary.

But, as the Reserve is established primarily to maintain favorable conditions of water shed protection on which the Plantations and the other large owners so much depend, it is clearly in the interest of these corporations to co-operate with the Government by setting apart the lands belonging to them until all of the area within the boundaries of the Reserve is devoted to the purposes of forestry.

As an example of the interest of the private owners within its boundaries in the creation of the Hilo Forest Reserve, the action of the Bishop Estate is significant. At the Public Hearing Mr. F. S. Dodge, Superintendent of the Bishop Estate, stated that the Estate was heartily in favor of the Reserve and proposed to co-operate with the Government in making it effective. The Estate has for some years maintained certain of its lands in the Hilo District as Forest Reserves, both within and extending makai of the boundaries adopted. It is expected that other large interests will follow the lead of the Bishop Estate.

PATERNALISM IN AGRICULTURE.

(Being a Paper read before the Social Science Club, May, 1905).

This is an age when the endeavor is being made on every hand to apply the results of scientific research to the problems of daily life and never before have the teachings of science had so profound an effect on the conduct of men. While the results of scientific advance are effecting the whole economic and social structure, perhaps in no other equally important department of human endeavor does the application of the laws of science have a more immediate and wide spread influence for good than when they are brought to bear on the problems which confront the husbandman in his struggle with the productive forces of nature.

You will, therefore, pardon me if I suggest that it might be profitable to consider briefly some of the important problems which applied science is solving in the agricultural world—be-

lieving that by reviewing in the light of local conditions the manner and methods by which some of the important results are obtained on the mainland, we may grasp more readily the possibilities that should result here in Hawaii if the paternal methods, which have proven so helpful to agriculture elsewhere, were more generally applied in this Territory.

But as the remarks which follow must by the nature of things take the form of an applied economic investigation it is desirable that before we proceed we should be prepared to take up the discussion as citizens of a civic entity striving to improve the civic well-being of our commonwealth, rather than as individuals who are battling for existence in an industrial war with the well-being of self and self alone as the central motive of our conduct. May we not then for the time being turn, for a little rest and recreation, from the perplexing problems of our personal affairs, from the consuming business of getting and spending on our own behest to consider the subject of agriculture in a broad way in the refreshing atmosphere of its bearing on and relation to the *public fortune* of the Territory rather than in the restricted selfish, though important, every day environment of individual gains, of investments, dividends and interest.

For if we are to profit by the investigation of any economic subject we must cease to be producer or consumer and rise to a high plain of disinterestedness that we may approach the matter in hand as a civic trustee, seeking to ameliorate or alter existing conditions, if at all, solely for the good of the state. So with only the greatest good in mind let us examine one phase of the great subject of economic agriculture particularly with reference to the possible benefits to be derived through the general acceptance and continued practice of a more liberal policy of paternal encouragement of diversified agriculture on the part of the Territorial Government.

Almost since the foundation of government, agriculture has received recognition and been given a more or less prominent place in the thought and legislation of the nation. We learn that while the Romans were carrying on wars against the heathen, they were daily introducing unknown fruits and useful plants, such as flax and lucern for growth in the home territory—Charlemagne had the eggs of his kitchen and the vegetables of his garden sold in the public market that they might attest

to his interest in the arts of agriculture. However, the political services of agriculture were not really understood until Quesnay, the great thinker and investigator on economic subjects, pointed out the important place that it must ever occupy among the agents of production. Sulley the political reformer, when elevated to power, devoted all his later energies toward the improvement of agriculture, which he considered the prime industry of his country. He believed that to truly enrich a prince, you must enrich his subjects. In consequence he lavished on agriculture endowments of every sort, and in a few years lands which had fallen into neglect in consequence of wars and abuses were brought under cultivation. Thus throughout economic history we find on almost every page some important reference to the place that agriculture has held in the affairs of the state and always find the welfare of agriculture closely interwoven with the well-being of the nation.

But without digressing further to the purely historical side of the subject, we then find that Sparta, Athens, and Rome had their systems of political economy—which were based on local conditions, for each *had* her economic problems to meet just as England, France, America and Hawaii *have* theirs to meet to-day. We know, too, that then as now each system doubtless possessed apparently adequate reasons for its existence in the needs which each state felt for an understanding of the economic conditions that confronted it. They, too, must have rules to guide them in their economic conduct. However, we can readily see that the problems of Rome were not the problems of Sparta any more than the problems of Hawaii are the problems of Porto Rico. Each system must of necessity be colored by local considerations. To illustrate; Porto Rico without railroads, wagon roads, machinery or even harbors, supports her million and a quarter of population by agriculture alone; while Hawaii, with all her improved machinery, with double the area and thrice the commercial advantages is supporting only one eighth that population. Porto Rico has labor, such as it is, in excess of her domestic demands; while Hawaii has to scour the earth for men to perform her menial tasks. It is plain that the working out of an economic problem for Porto Rico aids Hawaii only as it may throw a reflected light on Hawaii's difficulties. So we must appreciate that our agricultural and economic

problems are given us distinctly as our own problems. We must solve them, or break the slate and deny that we have problems to solve.

Then with a keen appreciation of the vital importance of continued agricultural prosperity in this Territory,—a subject so important and so self evident indeed that it needs only to be mentioned to be comprehended—knowing that if for any reason our agriculture fails to be productive of sufficient returns to satisfy the demand of the labor and the capital employed, that the economic stress on the community would be little less than ruinous to the commonwealth, the importance of taking steps to guard and provide wisely and well for the future and continued prosperity of agriculture no less than amply and justly for its present needs becomes our individual and civic plain duty

I need not here remind you that, agriculturally, politically and economically, we in Hawaii have “peculiar local conditions.” Perhaps no more distinctly peculiar conditions can be found in any other producing community the world over. Having no mines, no commercial forests, no varied internal commerce or exchange, no fuel and hence no factories; having only one source of civic wealth—agriculture, and having it centered as we do in but a single ruling industry in which all political and industrial interests are directly or indirectly centered,—the whole civic fortune of Hawaii is, as it were, daily staked on the hazardous turn of a single wheel of chance.

Thoughtful men may with reason inquire if a state which depends solely on a single source of revenue is safely within the broad principles of economic history in general, but more especially whether or not such a policy being necessarily a local one, is sustained by our own best civic judgment. If after seeing clearly the civic end to be obtained it becomes manifest that in economic policy we are falling short of giving a conservative, balanced administration of the affairs pertaining to our agricultural capital, should we not at once concern ourselves in devising ways and means to be employed looking to the gradual elimination of our civic shortcomings that we may arrive at the civic end we seek with as little loss or inconvenience as possible to the individual or the state.

In developing the sugar industry to a degree of perfection to

be found nowhere else in the world, Hawaii has made much of her most obvious agricultural possession and chief source of wealth. The satisfactory accomplishment of the undertaking in the face of many obstacles is a matter for civic congratulation. To the group of men who have worn themselves old wrestling with the problems with which such marvelous achievement has been fraught, this community owes a debt of gratitude which it should not grudgingly admit. More than any one group of men employed in agricultural operations they have forged for themselves the favorable conditions which have permitted the growth of their industry. In this discussion of local agricultural problems the wisdom which has in the past and is today displayed in zealously guarding the welfare of this, our principle industry, is fully appreciated. It is believed that for many years to come sugar will continue to hold its present prominent position in the industrial well being of the territory. Yet, may it not be instructive as bearing on the subject under consideration to review in as few words as possible the economic history of this industry, especially with reference to the artificial circumstances which have contributed most largely to encourage the growth of this form of productive effort until it stands to-day in such high financial favor that men will risk millions of dollars in an agricultural operation which depends for the very bone and sinews which support it on the subject of this essay—Paternalism in Agriculture.

While sugar cane had long been grown on the Islands, doubtless being of native introduction, it had received no serious attention until 70 years ago. At that time there were about a dozen recognized native varieties of cane growing on the group, a fact pointing unmistakably to the antiquity of its introduction. About the year 1835 the community experienced among other things a slight agricultural awakening. The commercial manufacture of sugar was then undertaken. After ten years of unaided experimentation the yield of sugar was not over one ton per acre. This out-put was accomplished by milling and other processes so crude that, when they are compared with the scientific system of sugar production as practiced on a modern plantation they become ludicrous in the extreme. The whole industry has been revolutionized during a lifetime. What industrial force has brought about this change?

Following the vicissitudes of the sugar industry as it occurs recorded in our local history, we find that after the establishment of a plantation on Kauai in 1835, six years of experimentation elapsed before a second was established at Kohala. The wages then paid averaged twenty-five cents per day. The amount of export sugar rose to 500 tons in 1843, but fell off afterwards and failed to reach that figure again for ten years. Then in 1850 came the settlement of California creating an abnormal demand for sugar as well as all the agricultural products of the islands. This was followed by the agitation of 1854 looking towards annexation, which was urged owing to the strong commercial interests in its favor. Though annexation at this time failed the prospect of it being consummated stimulated speculation and led to new plantation ventures. The production of sugar was greatly increased from 1860 on, owing to the importation of contract laborers from abroad and to the hope of reciprocity with the United States, which, unfortunately was not at that time consummated. However, the industry was given a tremendous impetus by the reciprocity treaty of 1875, which admitted raw sugar into the United States free of duty. The business then developed by "leaps and bounds." Nevertheless it suffered a serious depression after the passage of a bill under Harrison's administration which admitted all raw sugar free of duty and put a domestic bounty on the production of home grown sugar. Production rallied again after the removal of the bounty and the reinstatement of the duty. Since that time it has enjoyed unprecedented prosperity. Annexation saved to us a continuance of the paternal blessing of a tariff-protected market, and by increasing the confidence of the public in the future of the industry gave us the industrial inflation from which we are just emerging to ask for still more liberal immigration laws. To many, the foregoing is a dry recital of historic events. To the economist they all point to the stimulating power of paternal intervention in favor of the sugar industry on these islands. Just so far as circumstances have conspired to produce abnormally favorable conditions the industry has thriven. Whenever circumstances have failed in securing encouragement from without the industry has languished. By securing to the industry a tariff-protected market, the business has been spared the disturbances which would naturally arise from free competition.

By reducing the cost of production by supplying cheap and tractable labor the net earnings for sugar have been increased. So on through a long list of ups and downs. But by having a protected market, providing for large profits on the actual capital involved, the planters have been able to carry on the scientific exploitation of the problems of production—without loss to production; and thus they have always experimented to their pecuniary advantages. Therefore when it is asserted that paternal favor in one form or another on the part of the local, now federal, government, has been the fundamental avenue through which the application of the results of science to the production of sugar has been brought about, and when it is farther asserted that owing almost solely to the following out of the teachings of applied experimental science, it has been possible to convert the one-ton-of-sugar-per-acre plantation of 1840 into the ten-ton-per-acre plantation of to-day, the main contention of this essay will have been fairly stated.

. It seems an indisputable economic fact that, despite the thrifty methods of milling and culture, the production of sugar in Hawaii is dependent in the final analysis on the sustaining hand of the paternal government which through a succession of favorable circumstances has bolstered up and encouraged its production.

There may be some who would wish to dispute the conclusion here drawn. Lest there be one (present), let us pause to contemplate for a moment what might occur, for instance, if at the next regular session of Congress the people of America would decide that they were weary of supporting their no longer infant sugar industry and believing that the reasons which put a high tariff on the importation of sugar were no longer operative, and noting how sugar had flourished under this tariff form of paternal care they would decide to nourish some other, perhaps newer born infant industry into a healthy condition. Then in an inconsequent mood would take the duty of thirty odd dollars a ton off of sugar and put it on the importation for example of coffee, possibly going so far as to put a bounty on the production of beet sugar again. Or suppose that instead of granting more liberal immigration laws with especial reference to Hawaii and her local conditions, the labor vote on the mainland would insist on even more stringent labor laws, excluding even

Japanese coolie labor. Who ten years ago foresaw that Porto Rico, Hawaii and the Philippines would all be under the same flag. Who can with assurance state, that it may not be advisable for the federal government to extend the canal zone so as to take in a number of wrangling tropical states including Cuba, and give to them as she gave to Hawaii the blessings of a stable government, and at the same time free access to her tariff protected sugar market? Who can estimate the economic result in Hawaii if America should decide that her sphere of influence in the far east was only as a disinterested spectator—and that the Philippines should be allowed to work out their own destiny, while the Federal Government worked out her tropical race troubles closer home, thus leaving Hawaii as the outpost of American civilization. Or again the ultimate perfection of mechanical invention can by no means be regarded as having been attained. Is it not in the line of progress that improved agricultural machinery will continue to invade the tropical field—and ere long the practical cane harvester be made that will solve the labor problem for countries like Cuba and the Philippines, where the ridging and terracing of the lands for irrigation purposes is not necessary and where with a saving against us in the items of fertilizers and other expenses incidental to the production of our best crops here, they will be able to drive the cost of production below the limit where Hawaii can economically compete with her extravagant and unnaturally forced conditions. Then Hawaii's sugar industry would waste away precisely as Hawaii's rice industry is withering to-day under the blighting breath of the economic development of rice growing in Louisiana and Texas, where through cultural methods that we cannot adopt in our small terraced fields, they are reaping enormous harvests from lands which have never before been sufficiently productive to warrant extensive cultivation. Or who is there among us that can foresee the economic importance and bearing of the little entomological discovery that the tropics, which the white man has shunned as deadly, are made miasmatic and fever stricken, not by some mysterious providential plan to keep the white man out, but solely and simply because a little buzzing insect with a poisoned dart is too insistent in presenting his bill for services he has not rendered.

These are not extravagant statements made for rhetorical

effect. On the contrary they are all of them but too possible future, perhaps *near* future, economic and political developments any one of which may be upon us in full effect within five years without any more convincing premonition than was afforded, the rice planters that their industry would be devastated. While we are able to grow more pounds of rice to the acre in Hawaii, perhaps than in any other place in the United States, at least, we cannot cope with low cost of production any more than Hawaiian sugar can cope with the sugar of Cuba if she were annexed and given the advantages of the tariff protection we enjoy.

If the rice industry is to continue rents must be reduced. This means a reduction in values representing a loss of thousands, perhaps eventually millions to Hawaii. If Cuba, for instance, were given a free access to our market and a stable government, Heaven alone can estimate the financial ruin that would follow as our cane land values dwindle away to a basis where we can successfully compete with the planters of that island where it is reported officially that sugar can be produced and sold at a profit at \$31 a ton.

We of the present generation, have economic conditions to consider differing widely from those which confronted men a decade ago. They developed an industry for us, secured stable government for us; gained for us a protected market for most of our agricultural products. But in doing so, they figuratively sold our birthright, for while enjoying the advantages they gave us, we have lost the invaluable advantage which would, in emergencies, have allowed us to do for ourselves whatever seemed to concern us for the best. But to-day we are industrially at the mercy of a federal constituency, who, may regard our civic well-being as the least of their perplexities and may unwittingly vote us and our industries out of efficient existence at any congressional election. The management of our civic well-being has passed from our interested hands into the hands of corn growers and miners, and cotton growers, and meat producers, who ten years ago could not find Hawaii on the map of the world much less have told what was our chief industry, still less what form of paternal support would have contributed most effectively to our civic well-being.

If I have dwelt for a moment on the darker side of the possibilities of our agricultural future, it has only been to bring out in

its true relation, what appears to me to be the civic hope of this Territory. Happily, that hope is nothing new to our people. It is in no sense an untried theory. I refer to the possibilities that applied science holds out to us in enabling us to build up other,—even now unthought of industries here which will thrive under our fair skies; that will little by little divert our productive capacities into other profitable pursuits; that will establish a balance wheel of production which, when the emergency arises will enable us to withstand that shock, which would now prostrate the Territory if any one of a dozen possible political or industrial readjustments came suddenly upon us. We must return, *gradually* of course, to an equalized scheme of production—must cease agriculturally to be monotheistic and become polytheistic; must return to the ancient symbol of prosperity of “corn and wine and oil” as our maxim, in order that we may secure to ourselves and those who shall follow us the stability vouchsafed through the centuries to every community engaged in mixed agricultural production.

The Illinois farmer is not a wise farmer if he plants corn alone. How immeasurably more short sighted would Iowa be regarded if by any artificial adjustment of circumstances she rooted out every auxilliary productive industry and became simply and solely a corn state! Had Iowa committed such a civic blunder in developing her resources, I doubt not you would hear more from that quarter than we do about peculiar local conditions, with which they too had to deal. Fortunately they have plumbed their civic development by the old economic law of diversity of industry and have studiously heeded the injunction of the old proverb about the eggs and the single basket. In consequence they have made generous state appropriations for years to be applied toward the development of their agricultural resources.

The corn counties have been taxed to carry on experiments in cheese making and so on until to-day, when compared with her competitor states Iowa, leading in the production of corn also stands well to the head of the list in the production of various agricultural products such as dairy cows, and of course dairy products, horses, apples, hay, eggs, hogs, and dozens of other commodities. She has more farms and farmers, more schools and churches, more health and prosperity, to the square mile than any other equal territory under the flag. That a varied

and extensive list of products confers on her as a state distinct economic advantages are self evident. So self evident indeed, that Nebraska, a corn state, is also becoming a beet sugar and butter state. That by growing corn and apples and hogs on the same farm the owner is not so seriously hampered when conditions arise affecting some one of his products is patent to all. The farmer feels a reasonable human assurance that drought and apple blight and melon flies and hog cholera will not all strike his section at the same time. Diversification if it can be brought about with as little injury to our staple crop here as it has been brought about in several states on the mainland, would surely be a distinct gain for our sugar industry, for the people and for the common good. Can it be done? Certainly. How? By a gradual change to a broader agricultural policy. By *paternalism*, the force which has always been our main stay—our ever present help in a time of trouble. •

But we are constantly reminded that sugar is the only crop that thrives here. Granted. But don't lose sight of the possible change of the duty in favor of coffee or rubber or tropical products which cannot by any stretch of science or imagination be made to grow in Nebraska or Colorado or Michigan or New York.

The oft repeated warning that "we will have to grow something in the tropics besides sugar" has more than breath behind it.

Will we not be wise if we use the productive power we have to gain yet more power? Let us look at the situation squarely before necessity confronts us and begin now to prepare for immediate use that "something else" which we may have to grow whether we would or not before it is too late.

But again, I am reminded that the effort has been made to introduce other industries and that they have failed. Was there a paternalism behind them? Did the experimental farmer who was struggling lone handed with vanilla culture or castor beans or tobacco or rubber or tropical fruits have the hearty God bless you of the community with the encouraging recognition that he was a public benefactor—and the substantial assurance that if he would raise something we would help him get it to market? Did we go so far as to say that if necessary we would reappropriate from our taxes to his aid and encouragement a bounty

equal to the federal tariff bounty that sugar now receives as a territorial bounty until his produce had established itself in the market? We have but to remind you that in just such a way one of the states on the mainland developed her beet sugar industry which is successfully competing with Hawaii for its share of the market. The fact that many minor industries have been tried here and have failed in competition with sugar does not argue that had paternal conditions been as favorable for them as they have been for our ruling industry, they would not have failed nor does it prove that in the event of misfortune overtaking the industry which has over topped them that they would not spring again into existence to help tide Hawaii over a very awkward period of readjustment.

It is not enough paternal protection to encourage a man to even grow beans commercially to declare that the land upon which they are to be grown will be exempt from taxation for five years. How then can we expect men to go into tropical fruit production on a commercial scale dealing with plants, which take years to develop, producing fruit unknown to the palate of their consumers and costing large sums to establish in the market, on such penurious paternal encouragement. Yet five years exemption from taxation, is as far as we have got in Hawaii in territorial paternal encouragement. It is a beginning but it falls immeasurably short of accomplishing its object.

It seems to me that more than all else in this territory we need to get in line with the work, that is every where else being done through the United States Department of Agriculture in Washington, together with its various state experimental stations and the agricultural colleges which are radiations from the same head. These are institutions of which it may truthfully be said that whatever they have been established, they have at once set about to contribute to the substantial well-being of agriculture. There is always a very large proportion of pioneer experimental work necessary to the establishment of any industry which can only be done successfully through trained scientists working often through a period of years, using costly and elaborate apparatus or employing carefully planned systematic methods. This the individual cannot afford to do unaided. In almost every case it can be done most satisfactorily through experiment stations. That the work of our local station is beginning to be

more generally appreciated in its efforts, in this field of endeavor is by many regarded as the most hopeful sign in our industrial sky. When the important work that is done at experiment stations has had time to be more generally understood, I believe the people here as elsewhere will insist that their legislature shall see to it that this paternal institution has the local financial support necessary for it to carry on rapidly and effectively the pioneer experimental work that is here more than anywhere else, necessary to our larger and better agricultural development.

Before passing on, I wish to call your attention to the remarkable growth of agricultural paternalism on the part of the federal government through the Department of Agriculture, that what we are advocating may have the semblance of a sound foundation. In 1839 Mr. Elsworth then in charge of the patent office, had some difficulty in getting from Congress an appropriation of \$1,000 to be used as the bill states, for the distribution of seeds, for prosecuting agricultural investigation and procuring agricultural statistics. That appropriation coupled with the very high aim for which the expenditure of the appropriation called formed the genesis of the present department of agriculture whose head is a cabinet officer, and who received from Congress for the year 1904, an appropriation of \$5,428,000 for the maintenance and expansion of the work intrusted to the department.

In addition to this sum under the Hatch Act of 1887 over \$300,000 more was spent last year by the federal government in assisting to maintain 55 of the 60 experiment stations in the United States. In most states and territories the state appropriation equalled or exceeded their proportion of the \$800,000 of federal assistance. With this sum a regiment of 757 persons are continuously employed in the field of experimental research in the various states and territories. Thus are the problems of agricultural production worked out in their manifold and complex relations.

So well organized are these experimental workers, so skillfully are they assigned to their tasks that there is little or no duplication of work as will be seen by the perusal of the 370 odd pamphlets which were supplied free to over a half million farmers on the regular mailing lists of the department.

It can be readily seen that if Hawaii will provide for herself

local investigators to deal with these "very peculiar local conditions" to which we have had occasion to refer, she will have taken a step in the right direction. The federal government knows in a broad way about our general needs,—what is wanted, is to provide specialists who will make our wants known. By the system of co-operation which exists between station and independent workers, we will receive many times over the benefit we will ever be able to confer by securing our share of the paternal benefits that have already been provided. Scientists hunt in shoals—every pathologist is interested in our patheological problems. Every agristologist is interested in our grass and fodder questions and is willing to help us in every way possible.

I need hardly suggest that by making the provisions, I have suggested we will have taken a long stride towards quietly, introducing new and varied industries, a step which is believed to be the true desire of all who feel most keenly for the economic welfare of Hawaii.

Having emphasized the importance of the work which an experiment station properly appreciated and financed performs, and having suggested by a willingness on backing up the work of experiment stations by a willingness on the part of all to provide attractive territorial bounties when necessary on such industries as the station, after experimentation, might see fit to recommend for further general trial on a commercial scale. I would feel that I had been remiss if I failed to substantiate the faith that I have in this important form of paternal effort if I did not give a few examples of what scientific experimentation and subsequent encouragement has done on the mainland.

As you are doubtless aware, corn heads the list of American cereals, being valued at three billion of dollars annually. There has been no considerable change in the yield per acre in this crop for twenty years. The field offered a chance for experimentation with an increase in production as the object. The Illinois station actively took up the work with the result that after five years of test they found that by following certain lines of seed corn selection as practiced at the station—a simple farmer's method systematized—the increase in the production of corn in Illinois alone would annually be something like \$20,000,000. As a result of this scientific discovery the state

has a "Seed Corn Breeders' Association" and a seed corn special train annually makes a run of thousands of miles in the corn belt disseminating corn gospel to the producers.

The oats crop in the states in 1902 was estimated at \$300,000,000. It is pretty accurately known that the injury from smut is about 6 per cent. of the crop. Experiments have shown that this source of loss can be kept down by one per cent., representing a money saving of \$15,000,000. As a result of the improvements in the methods of culture, better machinery and improved seed—and the dissemination of results of experimentation carried on at the Louisiana and Texas stations—the increase in the value of rice lands on which it has been proven that rice can be grown amounts to \$10,000,000, while the increase in the money annually received from the crop represents a million more. There are available in the states mentioned 3,000,000 acres suited to rice growing. It is believed that within three years America will be a rice exporting nation.

The United States imports from Egypt cotton to the value of \$6,500,000. Experiments have proven that this cotton can be profitably grown in Arizona on irrigated lands similar to those in Egypt and it is assured that a new industry is created for the arid West.

Experiment station work in connection with the introduction of new varieties and the establishment of new crops is especially illustrated in the case of Kafir corn which was introduced from the heart of Africa by the department in 1886. It proved especially valuable in Kansas where the crop five years ago was valued at \$6,000,000.

The introduction of macaroni wheat gives every assurance that we will produce all the macaroni we consume at home—growing the wheat on heretofore unproductive lands.

The sugar beet industry in America is purely a child of paternal development and has grown up through co-operation with various stations to a production of millions of dollars worth of sugar annually. Of the improvements that are yet in store for this industry no one can form an idea. Last year it was settled that it was possible, by certain methods of selection and fertilization to increase the sugar contents of beets from 14% to 18%, the purity co-efficient from 80 to 83 and the yield from ten to thirty tons of beets per acre. Writing on this subject in 1902, Mr. Hagar remarked that: "To diversify agri-

culture as in the West; to succeed a waning industry as in the lumber region of Michigan; to add another item to the nation's list of products, reducing its need for importation—these are some of the broader advantages claimed for the beet sugar industry. With a large area adapted by climate and soil to sugar beet raising and with capital in abundance seeking profitable investment it will be strange if the United States does not find its way to make the industry a prominent and permanent one."

Instances of paternal influence in developing established industries or introducing new ones might be multiplied indefinitely. The effect of station work on such problems as soils and fertilizers, methods in system and culture, protection against injurious insect and plant diseases, the storage and utilization of farm crops, animal production, dairying, and a long list of the manifold avenues through which paternalism is brought to bear on agriculture in general might be given. But I hasten to consider some of the obvious local advantages which will be forthcoming from experimentation in the production of tropical fruits—perhaps new varieties from the tropics as yet unknown, to say nothing of the discovery and introduction of economic plants as yet not known at all.

To bring into being an improved fruit or flower of any kind is a high horticultural achievement. But to create a new fruit out of hand which surpasses in size, flavor, color and texture its progenitor is to many little short of the marvelous. Yet that it has been done not once or twice but dozens of times most of us can testify to from personal knowledge. Yet it has been comparatively but a few years since the fundamental laws which make such production possible were cautiously announced by a veteran scientist through a series of convincing essays setting forth the principles of evolution. To Mr. Luther Burbank has been reserved the distinction of applying those laws in the creative field of horticultural endeavor. As a result of a life devoted to applied science the world has been incalculably benefitted not so much by what he has done for it in his chosen field of research as by the generous gift to the world of the formulae by which his work is performed.

To produce the plum-cot by crossing such dissimilar fruits as the plum and the apricot or the peach-almond from such parents as a peach and an almond, or to give to horticulture the white blackberry are in themselves wonderful accomplishments. But

how generous is the spirit that has not only given to the world a new law of creation but also the inspiration of perfect creations brought forth under the law. Thus has Mr. Burbank given into the hands of his fellows, processes in nature so simple that a humble village gardener may astonish the world by intelligently following the rules of applied evolution in his daily work.

If Mr. Burbank and his associates can achieve such wonderful things as I have mentioned in California, who knows but that if a little patient paternalism be applied here in a similar direction, we may not develop a seedless mango, a *papaia* that will have keeping and shipping qualities that will enable it to be served in the city of Denver. Or an alligator pear that can be landed in any desired market. Or who will assert that it is impossible for us to create a new cranberry by scientific crossing of our *ohelo* berry with its Wisconsin cousin to produce a larger, better fruit than is now on the market—and one that would in every way be suited to our peculiar local conditions. Doubtless the rice planters would welcome such an innovation. A demonstrated natural law, which is so sweeping in its effect that when applied in the field of research its discoverer can only state its effect on the plant world in the words that we have found them “Eternally unstable in form, eternally immutable in substance,” puts to shame our conception of a specie and certainly holds out an immeasurable opportunity to the tropical botanist who can realize that the plants with which he deals are with knowledge, care and patience more changeable than our wildest fancies. For to quote Mr. Burbank’s own words: “We have learned that they are as plastic in our hands as clay in the hands of a potter or color on an artist’s canvas and can readily be molded into more beautiful forms than any painter or sculptor can hope to bring forth.” Truly there is an age of gold in prospect for Hawaiian agriculture when paternal encouragement shall make it possible for Mr. Burbank’s tropical disciple to arise.

I have unbounded faith in the possibilities of tropical fruits. The orange, the apricot, and all the fruits of the mainland are no longer luxuries on the table of the average American. When he wishes to serve something out of the ordinary he must look to the tropics for it. Let us appreciate our economic advantage and begin now with experiments looking towards increasing the wealth of the world and the pleasure of living in it by contri-

buting our share of the luxuries for the use of man which nature by endowment has intended we should.

But before I have finished this paper I must urge the importance of resuming a work which has languished here for a period of years. I refer to the importance of the introduction of new economic plants and new tropical industries. When we remember the long list of useful plants that were brought to these islands by the natives long before the advent of white man, we wonder that civilization has brought so few.

The isolation of the group has made the introduction of plants by nature or by the natives themselves an almost impossible task. Hence the fact that we have barren hills and unproductive fields does not argue that there is not somewhere in the world, plants which are suited to our economic needs. What a blessing was conferred on these islands by the fortuitous introduction of the algaroba. Who would have thought that the worthless little shrub of the great plains was to become Hawaii's source of wood, honey, not to mention its other obvious economic uses. Surely if the federal government considers it worth while to have a dozen expert men on the constant lookout for economic plants to introduce into the states, Hawaii which depends solely for all of its economic products of today on the casual introduction of the past could well afford to have one man at least who with a knowledge of our peculiar conditions and knowing of the great variety of soils and climates which exist here would go forth as Dr. Hildebrand did fifty years ago to scour the tropics for unknown fruits, grasses and trees with which to replant our vanishing forests or make our barren foothills to flourish in pasture or our tillable lands to bring forth yet more abundantly.

I wish to impress it on you that it is not enough to simply assert that our civic fortune must rest on a single export commodity until we have tried *in fact* all these avenues of applied scientific research which now *promise* so much. Neither is it enough to content ourselves with a single attempt at establishing an industry. As much faith as I have in the economic production of rubber in this Territory I should not be surprised if the Nahiku rubber venture failed to be as productive as it now gives promise; nor would I be discouraged. As long as scientists are still finding new species of oaks and elms in Ohio and Illinois I shall believe that the unexplored forests of the tropics

holds a species of rubber tree that will just suit our local conditions and when brought here will make rubber pay. One has but to recall the history of the Smyrna fig industry in California to see hope ahead for any industry that has ever been tried in Hawaii.

It is not enough then that we should content ourselves by simply minding the flies off of the industries that we already have, commendable as that work may be. Scientific research has opened the way for us in a bold manner in a field big with promise. On whatever side one turns his attention it is impossible not to be impressed by all the progress that has already been realized since science has put its hand to the plow and governments no longer stand aloof but are concentrating their paternal attention on problems pertaining to the general prosperity of man. The time has indeed come for action. Every thing advances with rapid pace, the movement which is bearing us on scarcely leaves us time to look about us. But little remains secure of the state on which our present local agricultural development rests. The possible alteration of the very institutions on which the agricultural regime of today is based is apparent. We must use the truths which science and experience has given us in our endeavor to win in an industrial war.

I feel that enough has been said to put before you in outline a civic ideal which is worthy of consideration. If this paper dealing with the broad subject of paternalism will serve to stimulate a discussion of the necessity of a more liberal interpretation of our economic and civic duty it will have fulfilled its mission. But if by disconnected and rambling allusions to what is being accomplished elsewhere I have suggested to you the possibilities which are within our own hands of gradually working back our agricultural policy to the more sane and balanced standards of diversified production as typified by the "corn and oil and wine" theory of prosperity I shall be gratified. If you are brought to feel as I feel, that by making use of our strong right arm, sugar, in an economic way, through paternal experimentation with the object, of seeking out for us, new fields of activity, and through territorial bounties, where necessary, encouraging the early development of such new and untried industries, as may prove to our advantage, much indeed will have been accomplished, towards the permanent good of the Territory of Hawaii.

WM. ALANSON BRYAN.

A PLEA FOR AGRICULTURAL EDUCATION IN HAWAII.

- I. The importance, growth and present status of agricultural education in America—II. The agricultural training offered at the Kamehameha Schools—III. A syllabus of an elementary course in agriculture suggestive for Hawaiian conditions.
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The expansion, differentiation and correlation of agricultural instruction to a degree when it shall form a part of and bear a definite and adequate relation to every school grade from the most elementary to the highest, in our rural schools¹ at least, has long been the hope of economists and agricultural leaders in all countries where agriculture is or may become a leading contributor to their prosperity and wealth. And it is now becoming more and more generally conceded in the more enlightened of such communities that education and training, suited to his special needs, will materially help the farmer and bring to his calling a dignity and standing equal to that of other leading professions. Likewise are our statesmen, and cultured people generally becoming better informed in the science of agriculture.

This growing interest in agriculture, especially in the United States is evinced by the increasing demands for the valuable, popular and scientific publications of our Federal Department of Agriculture and State Experiment Stations; the remarkable increase in attendance at our agricultural colleges, the improved and increasing number of agricultural text-books, and constantly enlarging circulations of high grade farm-journals—the strengthening and rapidly multiplying farmers' and scientific agricultural organizations generally.

To perhaps no other source is so large a share of credit due for this broadening outlook than to the scientific agricultural bodies just mentioned. Yet the splendidly equipped and well organized United States Department of Agriculture and the work of our State Experiment Stations and Agricultural Colleges are still too vaguely understood by a large majority of our

1. The term "Rural Schools" is here intended to include not only the schools in extremely rural districts, but also those in villages and towns which draw largely on the adjacent country for pupils and financial support.

people, to be utilized to their fullest and best advantage. However, an ever-increasing number of educators and progressive farmers are awakening to the value and desirability of a better and more definite education and training for our farmer youth and there is now being formulated a system of agricultural education and courses of instruction, which bids fair, ere long, to bring to the rising generation of agriculturists the advantages so long enjoyed by better favored professions.

The Granges, Farmers' Institutes and like associations, are doing an immense amount of good, especially for those past the school age. The Universities and Agricultural Colleges, supplemented by the experiment stations are training our advanced youth as experts and leaders,—which is their legitimate object, since to equip the investigator and teacher adequately, his educational foundation should be deeply laid in the pure sciences of higher physics, chemistry, biology, mathematics and economics, and for these the general equipment of a university is necessary. But the direct education of the great body of farmers is not yet university work; this must mainly come from schools below college grade, our rural common and secondary schools¹, schools of agriculture and special agricultural short courses, the two latter, as already organized by a number of our leading colleges, in the United States, notable among which are the schools established in connection with the Colleges of Agriculture in the Universities of Minnesota, Wisconsin, Nebraska, Tennessee and others which have likewise long maintained or recently added the now popular short fall and winter courses (having minimum of culture studies and pure science and a maximum of applied agricultural science.) Encouraging progress is also being made in secondary schools maintained independent of colleges. Ala-

1. The system of public education in the United States is now reaching a stage when the secondary schools and courses are being much more clearly differentiated from the institutions and courses of lower and higher grade. In this paper the term "common schools" is taken to mean schools giving instruction in grades below those of our secondary or high schools. These latter are no longer regarded as necessarily preparatory schools for the colleges. As a matter of fact, their courses, and even those of the common schools, are being more and more broadened to meet the varying needs of students who are to pass from them directly into the various pursuits and industries of American communities.

bama continues to support nine congressional district agricultural high schools which annually accommodate more than 2000 pupils at a cost to the state of \$22,500. The schools of agriculture are usually of high school grade their graduates meeting the entrance requirements to the technical agricultural group in the university, or it may furnish a partial preparation only,—in either case the courses are so arranged that the needs of the student whomust pass directly into active life is well equipped for *independent thought*. The short courses have been especially planned for farmers' sons and young farmers unable to leave home for an extended course, but desire instruction in some particular phase of agricultural instruction, or wish to become more proficient in some branch of agricultural practice—the short dairy course being a good example of an especially popular division. The advance in dairy practice has been so rapid and the relation of science to dairying so important that the dairyman without this modern knowledge and training is ill fit to cope with present new conditions. The writer can attest to the worth of some of these short courses from a brief six weeks' attendance at the University of California during the past summer. The special courses there offered consisted of Dairying, which course is planned to meet the needs of students who desire to make themselves familiar with the principles underlying the manufacture of dairy products, and the application of these principles to actual practice, to the end that they may know how to turn out an improved product. With its equipment of modern dairy machinery and in charge of trained instructors, it is remarkable how thorough an insight students acquire in so short a time. And that the work is practical as well as scientific may be known by the fact that the butter and cheese manufactured during this most unfavorable season and in a region not especially adapted to dairying, scored high in the critical San Francisco market. As an adjunct to the practical work, in butter and cheese making, a thorough course in the testing of milk and its products was given. Frequently lectures by specialists were given on dairy bacteriology, chemistry, etc. The subject of general agriculture consisted of lectures principally, in which was discussed the physics and chemistry of soils; the agricultural regions of California from original surveys conducted by the station staff covering years of painstaking research; fertilizers; irrigation

practice in California; grasses and forage plants; the beet sugar and canning industries; agricultural literature, etc. The subject of horticulture and entomology were arranged with a view to meeting the needs of the practical fruit grower, and must well have repaid all those in attendance. The viticultural course covered as fully as possible the best methods and practices of establishing and maintaining vineyards with special reference to conditions existing in California, as well as a special course in vinification and the manufacture of grape products and analysis, which the industry in California fully warrants.

The Division of Animal Industry took an important place among the short courses. The growing importance of the livestock industry in California being everywhere apparent.

Naturally, the dairy student availed themselves freely of this supplementary course. Instruction in judging, feeding, care and management of the various classes of live stock was given in class-room and at the college barns where a valuable nucleus of stock has been gathered. Veterinary science and minor animal surgery also came under the animal industry division and proved of especial value to young farmers.

Fifty-four students, including a number of women, were in regular attendance and included persons in all walks of life from the teacher and college graduate to the young farmer's son just out of the grammar school. I heard expressions of commendation from every side and personally felt many times repaid for my trip of two thousand miles for a short six weeks of scientific agriculture review.

NEEDS OF THE TIMES.

While the good work in higher agricultural education and the special short courses is now quite universally recognized there still remains a great gap between the upper and lower rounds of the agricultural educational ladder—a grave omission which is largely responsible for the lack of sympathy and appreciation in our country youth for their environment and opportunity, insulting in the consequent ever-increasing flood of our best young blood citywards. Here it meets with a thud, the fierce competition in a struggle for existence which ought not to be worth while for those who have lived the more real and simple rural life, and would not were it what it should, could and will yet be. Have you not noticed the “despised” Asiatic quietly and

smilingly filling in the places we have so lightly vacated?—growing fat and prospering while we curse and lament their successes and our failures?

The high schools and even schools of lower grade in our large towns and cities are being developed with special reference to different forms of commercial business and the mechanic arts, but up to very recently and still with very few exceptions have our rural schools had this very same curriculum thrust upon them. Does not such a course tend to train our youth away from the farm? or if through force of circumstances they be compelled to remain on the farm, has not a misfit been imposed upon them?

Surely if the technical and commercial education better fit its students as engineers and merchants, an agricultural training will prove of equal worth to those entering upon an agricultural career, provided it be as good in kind and is applied with the same intelligence, and yet this simple index has been overlooked till now. But the prejudice so long entertained against "scientific farming" and agricultural education could not long endure in these days. It chiefly arose from a misinterpretation of the meaning of "science" and "theory." Science as related to agriculture is no longer composed of abstruse and contradictory theories, but is "knowledge gained and verified by exact observation and correct thinking" and agricultural theory worthy of the name is more than mere hypothesis or speculation, it should be and is based on principles verifiable by experiment or observation as now conducted by our foremost investigators in the laboratories and fields of our great agricultural experiment stations. Still the farmer exists who maintains that science and art, theory and practice, are at war; he reads neither bulletins nor journals devoted to his calling, nor has he time to visit his station, fairs or agricultural associations; himself enslaved he would enslave his sons if he could. It is his lack of training education, and under the new order of things his antiquated practices are at fault, he cannot adjust himself to changing conditions and fails where his better trained neighbor succeeds. The majority of our successful and progressive farmers make free use of the findings and recommendations of their state experiment stations, problems they cannot solve are submitted to the station experts, and many new and improved methods, agricultural crops, and industries are having their inception at the

nds of these scientific workers. Could this do otherwise than inspire confidence? If further proof be needed as to the practical value of systematic training and investigation we may turn to the results of the contests at our state fairs and more especially the past several International Live Stock expositions held at Chicago in which our foremost breeders and feeders exhibited their various classes of stock. Witness how the comparatively few agricultural schools and college-trained farmers, and the few state experiment station exhibitors carried off many leading prizes with their superior bred and fed cattle, sheep and swine; and the Missouri station recently topped the Chicago market with a bunch of steers which it selected and fattened.

Every successful farmer is to some extent a scientific man; the farmer or stockman without thought, theory and science cannot have no plan, and thus wanting he must sooner or later fail. Other things being equal the most truly scientific farmer will be the most successful—the more thoroughly he *knows* the better he can do. The more deeply and clearly he can *think* the more advanced will be his art.

This paper is an argument in favor of systematic agricultural education, having its beginning in our rural common schools and passing through all grades to our highest institutes of learning. Thus far it has been the aim to point out the value and importance of such an education. In the following pages an attempt is made to present as exhaustive resume of methods and growth, with the present status of agricultural education in the United States, as limited space will permit, in the hope that the phase touched upon may be suggestive for our Hawaiian conditions.

The data here presented is largely a digest from the numerous valuable papers and reports issued by the Offices of Experiment Stations, United States Department of Agriculture, which in co-operation with the Association of American Agricultural Colleges and Experiment Stations has led the way in the forward movement of agricultural education in the United States.

(To be continued.)

AGRICULTURAL PUBLICATIONS.

In answer to enquires relating to agricultural publications of other countries, the Forester is glad to be able to supply the following information. Although the Forester endeavors to publish all agricultural information of local interest, no one in this Territory interested in the cultivation of the soil or its kindred industries can afford to be without at least one or two of the extremely valuable agricultural periodicals of other countries. Many of these are of a much more pretentious scale than our own magazine and nearly all of them contain each month practical articles on tropical and sub-tropical agriculture.

WEST INDIAN BULLETIN, the Journal of the Imperial Agricultural Department for the West Indies. Agents, Messrs. Bowen & Sons, Bridgetown, Barbadoes. Monthly, 6 pence.

The current issue, Vol. VI, No. 1, contains:

Cane Farming—British Guiana and Trinidad (32pp).

Review of the Principal Fungoid Diseases of the Sugar Cane.

Review of Insect Pests Affecting the Sugar Cane.

Field Treatment of Cane Tops for Planting Purposes.

The Polarimetric Determination of Sucrose.

The Central Sugar Factory in Antigua.

The Fungoid Diseases of Cacao.

Insects Attacking Cacao in the West Indies.

THE TROPICAL AGRICULTURIST, the magazine of the Ceylon Agricultural Society. Monthly. Edited by J. C. Willis. Agent, A. M. Ferguson, Colombo, Ceylon.

This magazine is probably as comprehensive and contains as much information as any agricultural publication. It generally consists of nearly 200 pages of closely printed articles, many of them of great importance.

The May number contains among nearly ninety articles, the following:

Bee-keeping in Ceylon.

Cocoanuts and their Enemies.

A Twig of the Bread Fruit: A Nature Study.

Rice Culture—Tamil Districts.

Growth of Para Rubber in South Ceylon.

How to Profitably Catch Crop Rubber.
Tobacco in Ceylon: Cultivation and Manuring.

JOURNAL D'AGRICULTURE TROPICALE. Published monthly by J. Vilbouchevitch, 10 Rue Delamblé, Paris, France. Subscription 20 francs per year, or 2 francs each number. This publication is one of the most important of those treating with agricultural conditions in countries similar in climate to Hawaii. It treats especially of information regarding Bananas, Cocoa, Coffee, Rubber, Cotton, Manioc, Ramie, Rice, Sisal, Tobacco, Vanilla and other agricultural products. It derives its data from tropical countries generally. Almost every number contains articles directly applicable to our own conditions of cultivation. The May number of this year includes among many others the following articles:

L'emploi du Riz en brasserie.

L'étude agronomique du Riz en Italie.

Distinction et multiplication des plantes textiles du genre Sansevieria.

Les appareils mécanique pour décharger les cannes.

Cacao sous ombre de Castilloa (description of combined plantation of cacao and rubber in Venezuela, etc.).

AUSTRALIAN PUBLICATIONS.

As a class the official publications of the different Australian colonies are probably the most interesting and important to producers in these islands. The following are particularly valuable: THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF SOUTH AUSTRALIA, published monthly by the Secretary of Agriculture, Adelaide. The May number, 1905, contains among many others, articles on the following subjects:

Hawkesbury Egg-laying Competition.

Transplanting Fruit and other Trees.

The Turkey (illustrated).

The June number contains the following:

Booming New Fruits.

Pickling Olives.

The Milking Machine (illustrated).

The Duck (illustrated), etc., etc.

THE AGRICULTURAL GAZETTE OF NEW SOUTH WALES. Monthly.

F. G. Chamley, Editor, Sydney. 6d per copy. This journal is of great importance to general Hawaiian readers. It is well illustrated and printed in clear type on excellent paper. The May number has articles entitled:

Farmers Fowls—The Wyandotte.

The Settler's Guide.

Ducks and Duck Farming, (illustrated).

The Prolific Northern Star Potato.

The Enemies of Bees, (illustrated).

Imported Pigs for the State Piggeries, (illustrated).

Dairy Notes—Shorthorn Cows—Butter Factory Reports.

Practical Vegetable and Flower Growing.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF WESTERN AUSTRALIA. Monthly. The Director of Agriculture, Department of Agriculture, Perth. May, 1905, contains the following:

The Angora Goat and the Possibility of the Mohair Industry in Western Australia.

Apiary Notes.

The Diseases of Bee Larvae.

Notes on the Experimental Farms.

The Philosophy of Hoeing.

THE JOURNAL OF AGRICULTURE OF VICTORIA. Monthly. Foreign subscription 4 shillings and 6 pence per annum. A most valuable publication. The May issue (Special Poultry Number) contains:

The Poultry Industry: Breeding and Management, Export, Caponising, etc.

Reconstitution of Vineyards.

The Pig on the Dairy Farm.

Groups of Fruits suitable for various regions of Victoria.

*Settlement Studies: The General Purpose Farm.**

Modern Bee Farming in Victoria: Hives.

The June issue (Special Dairy Number) contains:

Practical Guide to Dairying. (A comprehensive article of 50 pages, well illustrated, and describing, Breeding, Feeding, Management, Common Ailments of Dairy Cattle, Dairy Farm Buildings, Fodder, Dairy Management and Milk Testing.)

Forest Trees for Shelter, Shade and Ornament.

Tobacco Variety Experiments.

Animal Parasites: Stomach Worm of Sheep.

THE QUEENSLAND AGRICULTURAL JOURNAL. Monthly. A. T. Boyd, Editor. Ten shilling per annum. June, 1905, contains among many others the following:

Lambs for Export, (illustrated).

Why Farmers Should Plant Peanuts.

Orange Wrapping Machine.

Saleable Horses and How to Breed Them, (illustrated).

Elementary Lessons on the Chemistry of the Farm, Dairy and Household.

The following publications also often contain matter of importance to Hawaiian readers:

THE JOURNAL OF THE JAMAICA AGRICULTURAL SOCIETY. Monthly. Editor, J. Barclay, 4 Port Royal St., Kingston.

BULLETIN OF THE DEPARTMENT OF AGRICULTURE, Kingston, Jamaica. Editor, W. Fawcett, Hope Gardens.

THE INDIA TEXTILE JOURNAL. Monthly. 12 shillings per annum. The India Textile Journal Co., Bombay, India.

THE FLORIDA AGRICULTURIST. Weekly. 5c per copy, \$2 per year. The E. O. Painter Publishing Co., Deland, Florida.

THE WESTERN FRUIT GROWER. 50c per year. The Fruit Grower Co., 7th and Charles Streets, St. Joseph, Mo.

AGRICULTURAL NEWS. Fortnightly Review of the Imperial Department of Agriculture for the West Indies. Agents, Bowen & Sons, Bridgetown, Barbadoes. 3 shillings and 3 pence per year.

INDIAN PLANTING AND GARDENING. Weekly. Single copies 8 annas. Editor, H. Jackson, Calcutta.

FOREST LEAVES. Bi-Monthly. The Pennsylvania Forestry Association, 1012 Walnut St., Philadelphia, Pa. \$1.00 per year.

INSECT NAMES.

At the Seventeenth Annual Meeting of the Association of Economic Entomologists, held in Philadelphia on December 29th and 30th, 1904, the society, with the object of conducting to uniformity in the use of common names of insects, adopted a report of its committee on Nomenclature, consisting of Prof. Herbert

Osborn, of the University of Ohio, Columbus, Ohio, Chairman; Prof. F. M. Webster, of the University of Illinois, and Prof. C. P. Gillette, of the University of Colorado, recommending the publication of the accompanying list of common names of insects, these names being the ones current throughout a large part of the world and throughout the region of the species. They urged that every entomologist use these names and these only, for English names; that the Latin name be included but once in as inconspicuous a manner as possible; and that copies of this list be furnished to the leading agricultural papers of the country, and that the editors of such papers be requested to use these, and these only, in all articles referring to such species.

Only names were placed upon the list that were agreed to unanimously, a much larger list remaining under consideration for future action.

H. E. SUMMERS,
Secretary A. E. E.

List of Names Recommended for Exclusive Use.

American cockroach,	<i>Periplaneta americana</i> L.*
Angoumois grain-moth,	<i>Sitotroga cerealella</i> L.
apple-leaf skeletonizer,	<i>Canarsia hammondi</i> Riley.
apple-aphis,	<i>Aphis pomi</i> L.
army-worm,	<i>Heliothila unipuncta</i> Haw.*
asparagus beetle,	<i>Crioceris asparagi</i> L.
bag-worm,	<i>Thyridopteryx ephemeraeformis</i> Haworth.
bean-weevil,	<i>Bruchus obtectus</i> Say.*
bedbug,	<i>Klinophilos lectularia</i> L.*
boll-weevil,	<i>Anthonomus grandis</i> Boh.
boll-worm,	<i>Heliothis obscura</i> Fab.*
brown-tail moth,	<i>Euproctis chrysorrhoea</i> L.
buffalo tree-hopper,	<i>Ceresa bubalus</i> Fab.
cabbage aphis,	<i>Aphis brassicae</i> L.*
carpet-beetle,	<i>Anthrenus scrophularius</i> L.*
carpet-moth,	<i>Tricophaga tapetzella</i> L.
cattle-tick,	<i>Boophilus annulatus</i> Say.
cecropia-moth,	<i>Platysamia cecropia</i> L.
chinch-bug,	<i>Blissus leucopterus</i> Say.
clover-hay worm,	<i>Hypsopygia costalis</i> Fab.
codling-moth,	<i>Carpocapsa pomonella</i> L.

ado potato-beetle,
 a-stainer,
 ay maple-scale,
 ay-cushion-scale,
 anker-worm,
 veb-worm,
 ury-weevil,
 e-phylloxera,
 y-moth,
 quin cabbage-bug,
 ian-fly,
 y-bee,
 aphid,
 fly,
 bot-fly,
 e-fly,
 n-meal moth,
 r-beetle,
 rd-moth,
 terranean flour moth,
 t thrips,
 r-shell scale,
 i-borer,
 i-scale,
 slug,
 veevil,
 -curculio,
 -gouger,
 veevil,
 egged locust,
 chafer,
 Jose scale,
 y scale,
 orm,
 g canker-worm,
 sh-bug,
 ed blister-beetle,
 shed plant-bug,
 to-worm,

Leptinotarsa decemlineata Say.
Dysdercus suturellus H. Schf.
Pulvinaria innumerabilis Rathv.
Icerya purchasi Mask*
Alsophila pometaria Harr.
Hyphantria cunea Drury.
Calandra granaria L.
Phylloxera vastatrix Planch.
Porthetria dispar L.
Murgantia histrionica Hahn.
Cecidomyia destructor Say.
Apis mellifera L.* (Domestic).
Phorodon humuli Schrank.
Haematobia serrata R-D.*
Gastrophilus equi L.
Musca domestica L.*
Plodia interpunctella Hubn.
Dermestes lardarius L.
Zeuzeura reticulans.
Ephestia kuehniella Zell.
Thrips tabaci Lind.
Lepidosaphes ulmi L.*
Sanninoidea exitiosa Say.
Eulecanium persicae Fabr.
Ericampoides liminica Ratz.
Bruchus pisorum L.
Conotrachelus nenuphar Hbst.
Anthonomus prunivora Walsh.
Calandra oryza L.*
Melanoplus femur-rubrum Deg.
Macrodactylus subspinosus Fab.
Aspidiotus perniciosus Comst.*
Chionaspis furfura Fh.
Bombyx mori L.* (Domestic).
Paleacrita vernata Peck.
Anasa tristis Deg.
Epicauta vittata Fab.
Lygus pratensis L.
Phlegethontius sexta Joh.

B.—Insects bearing the mark '*' are present in Hawaii.

FARMERS' INSTITUTE.**NOTICE OF MEETING.**

The next regular meeting of the Farmers' Institute of Hawaii will be held on Saturday, August 5th, in Honolulu.

A business meeting is appointed for 3:30 p. m. at the Library of the U. S. Experiment Station at the head of Pensacola street. Important matters are to be discussed and all members are urged to be present.

The evening session will be held at 7:30 at the Y. M. C. A. Hall when the following program will be presented:

Plant Diseases and their Treatment (illustrated by stereopticon)	Mr. Jared Smith
The Nitrogen Problem.....	Mr. T. J. Crawley
The Care of Milk (illustrated by stereopticon).....	Mr. J. E. Higgins

The public is cordially invited to attend.

J. E. HIGGINS,

Secretary Farmers' Institute.

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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 8.

A FRUIT MARKETING ASSOCIATION.

Every man who grows something to sell would like to be a monopolist. From the producer's individual standpoint it would be better for all concerned if he alone could control the whole crop and eliminate competition. But when there are two men engaged in growing some crop, or two hundred, or two thousand, the market price of the article produced depends on the capacity of other people to use what is offered, and we say that the price is governed by the law of supply and demand.

Associations for the marketing of any product are simply an organized effort to abrogate this law of supply and demand, and put the multitude of producers back into the position of the first man who grew something to sell and who, at least theoretically, had no competition. Viewed from our selfish standpoint as producers this is not only a legitimate object but a highly commendable one.

The perfection and form of combination and the working plans of the organization will determine whether the association is completely successful. A completely successful combination of growers becomes a Trust, and hence illegal under the federal laws relating to combinations in restraint of commerce.

Innumerable marketing associations have been formed, but few have stood the test. The fundamental difficulty with these associations has been executive weakness in that these organizations are devoid of the power to enforce their rules and regulations. If there were only one man in Hawaii growing pineapples and that man owned all the pineapple land, so that no one else could go into the business, he would, as a monopolist, be legally within his rights, whatever action

he should take to control the production and marketing of his fruit.

There are now half a dozen pineapple plantations, each operating a cannery or expecting to operate one as soon as their first main crop is ready. There are many others who are planning to go into this industry as soon as they can make the necessary arrangements as to land and capital, because of the reputedly large profits now accruing to the pioneers in pineapple growing.

It does not require a vivid imagination to foresee the time when the supply of this fruit shall equal or outrun demand in the markets now open to our producers. Is it not, therefore, wise to "get together" and form some sort of a combination?

My own idea would be to incorporate a Fruit Factors' Company, the object of which should be to handle and sell the whole product, or at least all that is shipped out of the islands. Every man who grows anything should have the right to work up as big a local trade as he can or cares to. But the fruit shipped abroad, either fresh or in cans, should be handled by one concern in order to secure uniformity of grade and avoid the pitting of goods produced by A, B and C against those offered by D, E and F, and the consequent demoralization of the market. I have been informed that this form of unjust competition is practiced among buyers in many markets.

A combination of producers becomes illegal when it attempts to prevent any outsider, individual or corporation, from going into the same line of business in which the members are engaged. It becomes illegal when it attempts to force outsiders to sell to it and to no one else, at a price which it arbitrarily fixes. On the other hand, two or more individuals have the right to combine for mutual protection, and the combination may legally take the form of a mutual agreement to sell or buy only through a certain subsidiary corporation or through some individual. The line between legality and illegality is passed when the corporation assumes rights not granted by the people, through the medium of its charter, and attempts to make other people live up to its self-imposed obligations. These are some of the things to be avoided.

I believe that a Fruit Growers' Association in Hawaii is not simply desirable, but imperative.

JARED G. SMITH,
Special Agent in Charge, Hawaii Experiment Station.

THE NITROGEN PROBLEM.

BY J. T. CRAWLEY.

(Read before the Farmers' Institute, Honolulu, August, 1905.)

The most serious problem confronting the farmer of today in his relation to fertilization and of the fertilizer manufacturers who furnish him his wares, is the nitrogen problem; the most serious to the farmer because nitrogen is a necessary and expensive element of plant food, the most serious to the manufacturer because the supply is limited and fast decreasing.

Potash is found in almost inexhaustible quantity in the Stassfurt mines of Germany; it is recovered from the waste of beets in the manufacture of beet sugar, and it is believed that mines are in existence in Amercia and perhaps other parts of the world. While phosphate beds underlie great stretches of country in South Carolina, Florida and Tennessee, the islands of the Pacific, Algeria, and many European countries, the available natural supplies of nitrogen are chiefly the nitrate beds of Chili, and the coal fields from which sulphate of ammonia is manufactured in the processes of gas manufacture. As England is the only country that manufactures sulphate of ammonia in any considerable quantity, it is likely that the supply of this material will increase as the nitrate beds are exhausted and other nations take the matter up.

The Chili nitrate beds now supply the bulk of nitrogen used in fertilizing, in making gun powder and other explosives and many other artificial preparations, but at the present rate of increased consumption these beds will be practically exhausted in 30 years. What will or can take their place?

The importance, I might say the seriousness, of the question can be best appreciated when you realize that no plant

growth is possible without nitrogen, and that nitrogen is lost from the land in many ways, chiefly as follows:

1. The oxidation of organic nitrogenous compounds and washing away by water.
2. Destruction of nitrogenous compounds by bacteria and other natural agencies, and consequent loss of the nitrogen.
3. Crops fed to man and animals and the great loss of nitrogen through the sewage of the great cities.
4. The man ymanufactures of nitrogen compounds, chiefly gunpowder and other explosives.

Liebig (the celebrated agricultural chemist), more than fifty years ago, in speaking of one of the most common methods of destroying available sources of nitrogen, said: "Nothing will more certainly consummate the ruin of England than the scarcity of fertilizers. It means the scarcity of food. It is impossible that such a sinful violation of the divine laws of nature should forever remain unpunished, and the time will probably come for England, sooner than for any other country, when, with all her wealth in gold, iron and coal, she will be unable to buy the one-thousandth part of the food which she has during hundreds of years thrown recklessly away." Bull. 71, Bureau of Plant Industry.

Nature does not do things by halves, and our alarm, if indeed we feel any, can be allayed by remembering that four-fifths of the whole volume of atmosphere is nitrogen. But most plants do not and cannot make use of it in that form. It has to be combined with other elements before most of the ordinary agricultural plants can make use of it. One of the first and most important of the unsolved problems that the college professor impresses upon his students in chemistry is this, and great hopes of wealth and honors are held out to the ambitious student who can oxidize the nitrogen of the atmosphere and thus make it contribute to the growth of plants and animals.

A great deal of experimenting has been carried on along these lines, and many times with hopes of success. It was early discovered that the electric spark will cause the nitrogen and oxygen of the air to combine to form nitric acid, and great hopes were entertained that with the cheap power from Niagara Falls the making of nitrates would be a commercial

success; but up to the present time these hopes have not been realized. Nitrates, it is true, can be manufactured thus, but the expense is too great as yet to make the process a factor in the commercial world.

Another factor has lately entered into the question, and this is the chief point that I wish to discuss at this time. It was observed in very early times that certain crops, the leguminous, enriched the soil, and that after these leguminous crops were grown on a certain soil it produced other crops much better for several years. The leguminous crops were then regularly used in a well-directed crop rotation. In what way the soil was enriched or rejuvenated was not known, and it was reserved for modern science to determine that these plants add nitrogen to the soil upon which they are grown, and that this nitrogen is collected from the air by special bacteria which are present in almost all soils. A great many chemists and agriculturists, both in this country and Europe, worked on the problem to discover the means and the manner by which the nitrogen was assimilated and the bacteria themselves brought under the control of the farmer and made to minister to his wants. It was found that almost all soils contain the bacteria, and that a field containing but few, for instance, a poor field that would not grow successfully the leguminous crops, could be inoculated by carrying and spreading upon it soil from a field on which the legumes had flourished. But this practice was unsatisfactory by reason of the expense; and there was always the danger of introducing harmful weeds and grasses into fields where they are not found. Indeed, a number of cases of this kind have occurred.

An attempt was made in Germany to put up pure cultures of the bacteria in convenient packages and inoculate the land with them. As each different leguminous plant seems to have a specialized bacteria, seventeen different kinds were prepared, one for each of the most prominent leguminous crops. This preparation was called "nitrogin," and although good results were obtained by some European farmers, it failed in a great many cases, and in most cases where it was tried in America. The manufacture was finally abandoned.

A few years ago the United States Department of Agricul-

ture undertook the problem, the work being done by or under the direction of Geo. T. Moore, physiologist in charge of the laboratory of plant pathology. He studied the life history of the bacteria, and by means of most careful and elaborate experiments, and avoiding the mistakes of the European workers, he succeeded in preparing bacteria that could be transported and kept for a long time without losing their activity. It is unnecessary to go into the particulars of this work, but to state in general terms the outcome of the study as gleaned from Bulletin 71 of the Bureau of Plant Industry.

The bacteria is prepared pure in cultures practically free of nitrogen, it is absorbed in cotton, and small packages of this, together with the nutrient salts, are mailed to the farmer. Full directions are mailed with the packages so that the farmer cannot make a mistake, in short, as follows:

To 1 gallon of water add the nutrient salts and stir until dissolved.

Add the package of bacteria, cover with a paper and set aside in a warm place for 24 hours.

After 24 hours add the contents of the third package. Within 24 hours the solution will have a cloudy appearance and be ready for use.

To inoculate seed, take just enough of the solution to thoroughly moisten the seed. Stir thoroughly so that all the seeds are moistened, dry in a shady place, and plant. The soil itself may be inoculated by moistening with the solution and scattering over the field. The department recommends that the seed, rather than the soil, be treated.

These packages, prepared in the Department of Agriculture, were scattered throughout the length and breadth of the country, also sent to many foreign countries, so that they could be tested under the most diverse conditions. In all they have tabulated 12,490 tests of which they have received the results in Washington. These tests show that where the directions have been carefully followed out they were successful in the great majority of cases. I will read you a few of the reports:

ALFALFA.

Butler. L. G. Higley.—Bacteria for alfalfa was received in good condition about May 1. I prepared it and mixed it with about 20 bushels of rich soil, and sowed it on the field after plowing it. I sowed my alfalfa seed May 11, along with 2 bushels of smooth barley per acre. It has done better than any alfalfa that I ever sowed. It stands over a foot high nearly all over the field. There is hardly a square foot of land in the field that is not well set with plants. I took a spade today and went in the field to see if I could find any trace of the bacteria, and I soon found that the soil was full of it, every plant having lots of nodules on the roots. I then went to a field of 2-year-old alfalfa, which never was treated with bacteria, to see if there were any nodules there, and after hunting a long time I found a few very small nodules, but hardly enough to be really worth mentioning. This field is failing and I will have to plow it up. Alfalfa will grow on real rich soil without its bacteria, but I believe it will grow better with it; and if the land is the least bit poor it will starve to death if it has not its bacteria.

TEXAS, Fort Worth. W. H. Irwin.—Sowed 1,000 pounds of seed on 50 acres. Obtained one-third more alfalfa hay where inoculated; three-fourths ton per acre first cutting, 1 ton each other two cuttings.

WASHINGTON, Belma. Chas. Richey.—Inoculation very beneficial. Growth had formerly been very poor; plants turned yellow and many died, making it hard to get a good stand. Now difficulty is overcome.

RED CLOVER.

KENTUCKY, Hopkinsville. Ben C. Moore. Cut 2 acres of clover which had been inoculated and 2 which had not been, and find that there is a difference of about 500 pounds per acre in favor of inoculated seed.

Olmstead. John T. Young.—I think the clover will live. Good stand at present (October 26), although we have had the most severe drought since July 15 I ever saw. All other clover sowed at the same time is dead.

Warsaw. E. A. Rea.—Have a good stand, with a prospect of a fine crop next spring. Small plot in middle of field not inoculated all died out.

MAINE, Augusta. John Jackman.—The very best results. I soaked or moistened seed carefully, as per directions, and reserved small piece of ground for test; rest of ground was sown to same kind of seed, but catch on inoculated patch is noticeably stronger. It seems as if every seed came up and grew.

Portland. W. S. McGeoch.—Increased yield about 20 per cent.

Wayne. S. H. J. Berry.—Have in previous years had very unsatisfactory results in getting a catch of grass, and especially clover. I tried the bacteria for this crop and am well pleased with the results.

MARYLAND, *Grayton*. Rev. William Brayshaw.—Report on clover sown September, 1903, at Valley Lee, Md. I sowed two lots of seed side by side, one inoculated, the other with 100 pounds of South Carolina rock. Inoculated made double the growth and bade fair to give three times the quantity of hay. (A later report states that the clover was pastured, and no figures as to final yield could be given.)

COW PEAS.

LOUISIANA, *Cades*. C. E. Smedes.—Increased the nodules 75 per cent. more than peas planted next to them, and vines were more luxuriant. *Lafayette*. Ray Fireo.—In 1903 I sowed peas on a side hill and the peas did not grow over 8 inches high, with very small nodules. This year the inoculated peas sown under same conditions made a growth at least four times as great.

St. Martinville. George Lind.—Cowpeas grew well, forming nodules in plenty. I consider the inoculation a success.

MARYLAND, *Chaptico*. William H. Gardiner.—The 2 acres inoculated grew twice as large, as peas were more prolific than uninoculated part. In fact, the 2 acres were the only part harvested. The rest of the field was insignificant.

MISSOURI, *Marionville*. U. L. Coleman.—Where inoculation was used the peas did a great deal better and produced fully one-third more. I found few nodules where the inoculation was not used, but where inoculation was used the roots were literally hanging full of nodules, some as large as peas. I showed samples to several of our farmers, and they all stated they had never before seen as many nodules on one vine.

BEANS.

MICHIGAN, *Brinton*. B. B. Stevens.—Plants more vigorous and better podded. Estimated increase of yield not less than 25 per cent. Am well pleased with the experiment.

Saugatuck. F. M. Kreusch.—I gathered the beans about September 20; have only thrashed part of them, but I am sure I will have five times as many as last year on the same ground. I think it is immense.

In general, and in conclusion, it may be said that the preparation of bacteria will assist in the production of leguminous crops in poor soils—soils particularly poor in nitrogen, but that they have little effect in rich soils, or soils rich in nitrogen; that excessive amounts of potassium and sodium salts, common salt, for instance, prevent the work of the bacteria, but that calcium and magnesium salts assist their action. Lime should therefore be added to those soils poor in this element.

Their best action is also obtained by thorough preparation of the soil, and the maintenance of the proper amount of soil moisture.

The financial benefit to be derived may be seen by saying that in Germany about 200 pounds of nitrogen is added per acre by a crop of legumes, and 122 in the United States, and that the cost of this in a commercial fertilizer in Hawaii would be \$35.00 in the former case and \$20.00 in the latter.

Since writing the above, bulletin No. 224 of the Michigan Agricultural College Exp. Station on "Observations on the Influence of Nodules on the Roots Upon the Composition of Soy Beans and Cow Peas," has come to hand. Plats of soy beans and cow peas were grown, one of each being inoculated and one not inoculated. The crops at harvest were weighed and analyzed, and although but little difference in the color, general appearance and growth of the growing crops, or the weight at harvest, the inoculated plats of soy beans contained 56% more protein, and the cow peas 47% more protein than the plats not inoculated. This is very important, for if this be generally true, one cannot judge that since inoculation of a given crop did not cause the soil to produce a larger and more thrifty crop than is produced without inoculation it is therefore of no benefit, for the feed may be of greater value and the crop add more nitrogen to the soil.

A NEW HAWAIIAN INDUSTRY.

The Hawaiian Islands, proud of their rank in the commercial world, have added another industry, which in a short time has attained great success.

The thoroughly modern-equipped tannery, established at Kalihi by the Metropolitan Meat Co. of Honolulu, promises to become one of the leading industries of the islands. The large and constant demand for leather of various kinds has made the tannery a long-felt want by the people of Hawaii, and was therefore greeted with high approval when taken up by



The New Tannery, Exterior.



The New Tannery, Interior,

one of the largest and most successful companies in Honolulu.

The building is a large three-story structure fitted throughout with all the latest improvements and conveniences for the purpose of making leather.

Mr. Geo. E. Sahlin, an experienced tanner of Boston, was employed as superintendent when the tannery was put in operation last August. He has under him twelve men, who are busily engaged in manufacturing leather to fulfil the steadily increasing orders.

Not only is the local demand for leathers met, but each month large shipments of various kinds or skins are sent to Japan and to a large number of consumers in Mexico, California, Washington, Denver, Boston and elsewhere. All report the leather in every way satisfactory, and are constantly increasing their orders, so that at no distant time an enlargement of the establishment will be necessary.

The chief products of the tannery include kangaroo sides of shoe leather, kangaroo kips and calf, Persian kid from sheep, sheep lining, shearlings in tan color and white, cow hide, lace leather, cow hide for hydraulic pumps and white leather for cleaning rice. The demand for the last named is principally local. Any samples of leather submitted are also exactly duplicated.

The Metropolitan Meat Co. are able to tan the hides from their own cattle, and thus are in a position to offer their products at advantageous terms. This inducement, added to the fine quality of goods turned out, insures a large and profitable business. The J. A. M. Johnson Co., Ltd., Fort street, Honolulu, T. H., are agents for the tannery.

THE VEGETABLE GARDEN.

AUGUST.

As recommended for trial to readers of F. and A. in the June issue, the "rest cure" was applied to our soils at Kamehameha during June and July. By the first of August, the cloddiest roughly plowed fields were in fine mellow condition due solely to the wonderful unsubstituable influences of sun and atmosphere, and this, notwithstanding the total absence of rain during those months, whose solvent properties are usually considered necessary to bring about perfect friability of the soil mass.

Once harrowing and cross-harrowing quickly and completely leveled ridges and furrows remaining from the previous rough plowing and only slightly exposed the valuable forming humus regarding whose development and conservation so much has already been said. After harrowing, the extreme light and mellowness of the soil necessitated firming with a heavy drag and left the surface perfectly smooth and just sufficiently compacted.

Had rains started weeds and perhaps puddled or at least more or less compacted the soil, plowing would have become necessary before seeding, but because of the mellowness of the soil, almost complete absence of weeds and the splendid development of humus, was plowing not only unnecessary but might have proven positively injurious in the destruction of the fine humus mass.

Drills were now furrowed thirty inches apart with a light plow for the field culture of beans and beets,—extensive plantings of the former to supply our three hundred odd students with this wholesome and delicious vegetable, and as succession is desirable and easily maintained throughout the year a definite plot of well drained land is set aside to permit of a continuous succession of bi-monthly sowings, allowing three plantings on the same soil during the forty weeks of the school-year.

The varieties sown are a Kamehameha selection of the improved Golden Wax (Dwarf) for snap beans and Burpees' and Henderson's dwarf limas, to which we now confine ourselves after several years comparative testing of all the leading varieties. For a more extended list of varieties suitable for Hawaiian conditions the reader is referred to "The Vegetable Garden" in January issue of this publication.

An extensive planting of fodder beets for comparative test was

made on August 10th, the following varieties being sown: Long Red Mangel Wurzel, Giant Yellow Intermediate and Golden Tankard.

These are standard sorts for stock feeding and under favorable conditions in California yield enormously; former trials with us have not been as successful as we should have wished, but at this writing (Aug. 21), the young plats are doing finely.

An acre has been sown to squash, the unoccupied space between young papaias set eight feet apart each way, being utilized to good advantage.

The old standard Hubbard variety has been largely planted and should produce a large per cent. of mature fruits by Thanksgiving. All desiring to produce their own squash for Thanksgiving pies are urged to sow seeds immediately.

Last year Kamehameha farm swooped the Honolulu market with 3000 pounds, part of which sold at from 3 cents to 6 cents per pound or at the rate of about \$250 per acre for land occupied with a four months crop (the 3000 being the product of about one-half acre). One and a half acres of sweet corn, a Kamehameha selection of the Mammoth sweet variety, which it is intended to convert into Silage. The plans for a modern Silo (probably the first in the Hawaiian Islands) being completed and the construction of which will probably soon be undertaken.

Beds four feet wide with an eighteen inch aisle between were thrown up in the rough with a large two horse plow, three rounds of the plow making 8"x12" furrows, quickly formed the desired beds, and greatly lessening the heavy hand work otherwise necessary.

Beginning with the first week in August, the following kinds and varieties have been sown to date, the heavy broadcasting of barn yard manure earlier in the season being the only fertilizer thus far applied, excepting a light covering of coarse manure after sowing to act as a mulch:

Garden Beets.—Imp. Blood Turnip Crosby's Egyptian, Early Eclipse.

Table Carrots.—Half Long Danvers, Ox Heart, Early Scarlet Horn, French Forcing, Collards.

Southern or Creole Cucumbers.—Long Green.

Cucumbers.—Long Green.

Lettuce.—Calif. Cream, Morse, Passion, Blk. Seeded Tennis Ball.

Okra.—White Velvet.

Onions.—(Kamehameha Grown and Hawaiian Grown Sets),
Onion Seeds.—Prize Taker, Red Weathersfield Australian

Brown.

Parsley.—Fine Doubled Curled.

Peas.—Improved Strategem.

Radish.—Rose Queen, Scarlet Turnip, Improved Charlier.

Salsify.—Sandwich Island.

Turnips.—White Egg.

And the following for transplanting later on:

Broccoli.—White Cape.

Brussel Sprouts.—Perfection.

Cabbage.—All Seasons, Cox's Early Spring, Surehead, Select
Flat Dutch.

Cauliflower.—Cox's Calif. Wonder, Ex. Er. Snowball.

Celery.—Golden Self Blanching, Giant Pascal, White Plume,

Celeriac.—(Turnip Rooted). Large Smooth Proque.

Egg Plant.—Blk. Pekin, Burpee's Blk. Beauty.

Peppers.—Chinese Giant, Red Chili.

Tomatoes.—Livingston's Beauty, Selected Trophy, Crimson
Cushion Acme, Royal Red.

For detailed cultural direction of which, see previous numbers of the Forester and Agriculturist. While not the most favorable season for the whole list planted, satisfactory results may be expected from nearly all if precautions are taken to guard against excessive wet by sowing in raised beds and hills, on the one hand, and mulching with light litter and careful watering on the other, should another dry spell set in.

The recent rains have proven very beneficial with us, fodder fields of *Panicum* which were brown from drought have revived and are making a fine growth and the young vegetables just sprouting are growing rapidly, weeds too are making great strides and need prompt suppression to prevent smothering of tender seedlings.

In continuance of general cultural notes in which the May issue dealt with "Root Crops" we again take up in regular order the remainder of the general list of vegetables.

CELERY. *Apium Graveoleus*.

F. *Celeri*. G. *Selleric*. ITALIAN. *Sedano Apio*.

While we cannot hope to grow Celery like the far famed Kalamazoo product, or the rich moist peat lands of Orange County,

California, some of our cooler moist localities, will grow fair celery as has been amply demonstrated by the Volcano House product, and a few other favored localities in Hawaii.

But as the plant will not endure a high dry heat, our leeward districts are not adapted to its culture except perhaps for the growing of a few sprigs for soup greens.

Remembering then that Celery thrives best in an equable cool temperature with an abundance of moisture, the additional important requirement is an abundance of decomposed vegetable matter in the soil, hence the splendid adaptability of the natural peat lands, and any one possessing such a soil, other conditions being equal, would do well to give Celery a trial with a view of producing the crop on a commercial scale. However, a good deep garden soil, well enriched with thoroughly rotted barn yard manure, deeply worked in may be made to give fine results where climatic conditions are favorable.

Young plants should be grown in seed beds and transplanted when about four inches high. If previously thinned out to prevent over crowding sturdy plants will result, and such are the only kind worth transplanting.

As the seed is small and germinates slowly, it is useless to attempt sowing the seed in permanent beds, besides Celery as with a variety of other vegetables, transplanting is desirable for the production of a stocky growth.

Seed sown at this time should produce plants ready for transplanting in November. When about three inches tall which should be in October, cut back the tops one-half and just before transplanting repeat the operation and at the same time cut back the tap root without disturbing the fibrous root mass. Set the plants six to eight inches apart in deep furrows twenty-four to thirty inches apart to permit of banking as the plants grow in height.

In setting the young plants it is important that the soil be well firmed about the roots, and the soil never permitted to get dry. When the plants are ten to twelve inches high they are ready for blanching and this is perhaps best done by setting 12 inch boards on edge on each side and close to the row of plants; it is important that the stalks be dry when the banking or planking is done, else they may rot. If the leaves are permitted to lap over the edge of the board they will sufficiently shed rains.

It requires about a month to blanch the green varieties while the

White Plume and similar sorts are more quickly treated. An ingenious method of blanching a few Celery plants is to set 5 inch drain tiles over each individual plant, but anything that will exclude light and water from the stems will do.

VARIETIES,

While never very successful with Celery at Kamehameha, an extensive trial made last year proved quite encouraging. The following standard varieties were tried:

Imp. White Plume, Giant Pascal and Gold self-blanching, the two former doing best. The so-called self-blanching sorts are improved by artificial blanching.

A root aphid attacked our plants towards the close of the season last year and were not discovered until nearly time for harvesting.

It is believed that a strong solution of ammonia water, say a quart bottle of washing ammonia to five gallons of water would be effective in ridding infested plants.

CELERIACE. Idem.

F. *Celeri-rave*. G. *Knoll-sellerie*. ITALIAN. *Sedano-rapa*.

Celeriace is an abnormal rooted Celery highly prized for cooking and salad purposes. The root, which is greatly enlarged, is the part used.

The cultural methods are the same as for Celery, except that blanching is not necessary.

THE MANGO WEEVIL IN HAWAII.

Cryptorhynchus mangiferae Fabr.

(Orderg Coleoptera or beetles. Family, Curculionidae or Weevils.)

D. L. VAN DINE,

Entomologist, Hawaii Agricultural Experiment Station.

On July 5, 1905, Mr. J. E. Higgins, horticulturist of this Station, discovered in the seeds of mangoes the larvae and the pupae of a beetle which during their larval development had fed entirely

on the seed contents and had undoubtedly destroyed the germinating power of the embryo or at least injured it to such an extent that decay would follow if the seed were placed in the soil. Two days later the writer visited a mango district in the vicinity of the place where Mr. Higgins found the infested fruit and obtained larvae, pupae and adults of the same species. Duplicates of these forms were forwarded on July 11 to the Bureau of Entomology of our Department at Washington, D. C., and examined and reported upon by Mr. E. A. Schwarz under date of July 26. Mr. Schwarz gives the determination of the weevil as *Cryptorhynchus mangiferæ*, originally described by Fabricius in 1774 and says further that: "Its original home is uncertain, for since many years it has spread (no doubt through the agency of man) throughout the 'Oriental Region' from Madagascar through India, Ceylon, etc., to Java and other Malayan Islands. It probably occurs now also in many of the Islands of the Pacific Ocean, although I fail to find any records. The species is not enumerated by Sharp from the Hawaiian Islands and is no doubt a recent introduction there. The weevil appears to be extremely injurious to mangoes, and accounts of its ravages are numerous."

Since the life-cycle is passed within the seed and the female, as is customary with the species of this family, deposits the egg in the food of the larva, the insect must have been introduced in fruit or seeds of the mango brought to the Islands for propagation from India or possibly the Philippines. It is evident that the fruit is infested in the very early stages of its development for the reason that there is no indication of the entrance to the seed of the larva through the seed husk. The work of the very young larva is indicated and since no point of entrance is to be observed, it would seem that the length of the life cycle of the insect is somewhat longer than the time of development of the fruit as shown by the fact that seeds removed from natured mangoes contain the larval weevil.

In the first lot of mangoes examined it was estimated that about 60 per cent. were infested, that is, out of 44 seeds examined, 28 contained either the advanced larval, pupal or adult stages. The next lot examined six days later, at the same place, resulted as follows: 16 seeds each were taken of the No. 9, the Chutney and the common "Hawaiian" variety and of the No. 9, 11 were good and 5 infested; of the Chutney, 6 were good and 10 infested; and of the common variety, 8 were good and 8 infested. The

following varieties planted in seed beds were examined: 12 seeds each of the Chutney and the No. 1 were selected at random and of the former 10 were infested and 2 were good; and of the latter 3 were infested and 9 were good. In both instances the Chutney shows the largest number of infested seeds.

By removing the husk of the seed, the presence of the weevil is easily detected and therefore all seeds planted should be thus treated. This is good horticultural practice in any event. Until the distribution of this insect pest in the Islands and its life cycle, habits and food plants are better understood, it is to be urged that mangoes will not be indiscriminately distributed from place to place. At the beginning of the next mango season an inspection of the various districts will be made and it is hoped that by that time practical and efficient measures of controlling the pest can be given. If the insect is found to attack only the mango and its present distribution is determined as being confined to certain districts, it may be that by a rigorous quarantine and the destruction of the crop, the pest can be stamped out.

As to direct remedies, if it is found that infested fruit falls to the ground, they should be collected and destroyed; it may be that, as is the practice with the Plum Curculio, the adult beetle can be jarred from the trees onto sheets in the early season before they infest the fruit; or, if the adult feeds on the leaves of the mango, they can be poisoned by spraying with Paris-green or Arsenate of Lead.

FOREST RESERVES ON MAUI AND KAUAI.

During July two important Forest Reserve matters came up for action before the Board of Commissioners of Agriculture and Forestry, viz.: The creation of Forest Reserves in the windward districts of the Islands of Maui and Kauai.

As both the Proposed Reserves are of general interest to the people of Hawaii, the reports of the Superintendent of Forestry regarding them are given herewith. It is the desire of the Board that the reasons underlying the creation of each Forest Reserve be well understood. Consequently it is the intention of the Board to publish from time to time as the different reserves are created the reports, recommendations and resolutions adopted in regard to each.

The complete description of the metes and bounds of the proposed reserves will be published as a part of the Governor's proclamation setting aside these areas for forestry purposes. As the descriptions are technical and somewhat lengthy they have been omitted from the reports as here published.

The gross area of the Koolau Forest Reserve on Maui is 43,000 acres, more or less; of the Halelea Forest Reserve on Kauai, approximately 37,500 acres. Of these areas about 15,000 acres in the Koolau Reserve is unleased Government land. This section will be set apart by the Governor as a compartment of the Koolau Reserve. In the Halelea Reserve the area of Government land not now under lease is about 11,000 acres. The remainder of the land within the limits of these reserves is owned or controlled by private individuals or corporations. It is expected that most of these will co-operate with the Board in devoting the land within the reserve boundaries to forestry purposes.

The reports of the Superintendent of Forestry follow:

KOOLAU FOREST RESERVE—MAUI.

Honolulu, July 28, 1905.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—

I have the honor to submit herewith a report with recommendations on the Proposed Forest Reserve in the Districts of Koolau and Hamakualoa, Island of Maui.

The area with which this report deals may be roughly described as extending from the Hana-Koolau District boundary line, at the East end, to the land of Opana in Hamakualoa, at the West, and from the line of the Koolau and Upper Hamakua Ditch to the crest of the ridge on the North side of the crater of Mount Haleakala.

The report is based upon a personal examination of the area made by me during visits to Maui in September and November, 1904, and upon additional information obtained during and since these visits from Government officials and other persons familiar with the locality.

I would here note my special obligations to Messrs. H. P.

Baldwin, H. A. Baldwin, W. F. Pogue, Hugh Howell and L. von Tempsky for information, assistance and various courtesies extended to me.

The object of the Proposed Koolau Forest Reserve is to protect the native forest now covering the water sheds of the streams on the windward side of Maui which supply the water for irrigating the great Wailuku Plain lying between Mount Haleakala and the West Maui Mountain. This area when irrigated is among the most productive land in the Territory. Without water it is of only inferior value for grazing.

Under existing conditions sugar-cane is the most profitable crop that can be grown on this land; a statement which will doubtless remain true for a long time to come. But even if with altered economic conditions it were some time found advisable to substitute other crops for sugar-cane, irrigation would be none the less necessary if the most satisfactory results were to be obtained.

Because of its situation, climate and soil the Central Maui Plain must forever remain one of the most highly productive areas in the Territory, provided always that it continues to receive an adequate supply of water for irrigation. Nowhere in the Territory are the benefits of irrigation more marked, while from its location in regard to transportation facilities this section possesses advantages unusual in Hawaii.

For these reasons the protection of the forest upon which depends the regularity of flow in the streams that supply its irrigation ditches, is a matter of prime importance. And it is of importance not only to the interests immediately concerned but also to the community as a whole, because through the increased production made possible by the application of water to land otherwise of little value, the Government profits both through an increase in direct taxation and also through the indirect benefits which accrue to the Territory by reason of the many and diverse interests which the main industry gives rise to and supports. It has been stated by Mr. M. M. O'Shaughnessy that for each additional 1,000,000 gallons of water per day, 100 more acres of cane land can be brought under cultivation. The average number of tons of sugar per acre from the 1904 crop of the Hawaiian Commercial and Sugar Company was 7.23. These figures do not require further comment.

The Baldwin interests which control the greater part of the Central Maui Plain, are keenly alive to the value of forest protection, and with commendable foresight have done much to protect the existing forest in the Koolau District, as well as, by extensive planting of forest trees, to extend the forest cover over other lands. Furthermore their representatives have expressed their desire and intention to co-operate with the Government in the creation and maintenance of the Koolau Reserve.

The Koolau District on Maui has many features in common with the District of Hilo on Hawaii. Each lies on the windward slope of a high mountain and so receives the benefit of the heavy rainfall that comes from the clouds brought in by the trade winds. The belt of heavy precipitation on Maui apparently extends lower down the mountain side than it does in Hilo and the maximum recorded rainfall is greater in this district than anywhere else in the Territory. Records kept during the construction of the Koolau Ditch show as is to be expected, that the rainfall is much greater in the forest belt than that recorded at the regular stations below. The rainfall gradually diminishes toward the west but throughout the Koolau District it is heavy and during a good part of the year almost continuous.

The native forest in the Koolau and Hamakualoa Districts is made up of the trees commonly found on the windward side of the Hawaiian Islands and forms where protected from injury by cattle or fire, as almost all of the Koolau forest is, a dense, almost impenetrable jungle. At the higher elevations there are heavy stands of Koa (*Acacia koa*) which perhaps some day may be turned to economic use. Lower down the predominant tree is the Ohia Lehua (*Metrosideros polymorpha*). In mixture with the Ohia are found a variety of the other and less important trees of the Hawaiian forest. The undergrowth throughout Koolau is dense and luxuriant, tree and other ferns, shrubs and climbing vines covering the forest floor in great variety and profusion. On the sides and in the bottoms of the numerous gulches native bananas of many kinds grow to good size, an indication that these lands may ultimately be turned to account in fruit production or perhaps in growing plants of the allied genus yielding Manila Hemp.

The Districts of Koolau and Hamakualoa are characterized

a succession of deeply cut gulches, an interesting example of erosion resulting from heavy rainfall. Outside of the trails following the irrigation ditches and the main Government trail to the Coast, the country is without roads of any kind. Combined with the character of the forest this fact explains why the main body of the north slope of Haleakala remains practically unexplored.

Considerable interest is just now being manifested in the Koolau District in the cultivation of rubber. A plantation has been started at Nahiku in a sheltered situation and at a low elevation, which if successful will lead to the establishment of a new industry in the Islands. The plantation is still in the experimental stage but if it develops as satisfactorily as the present indications promise, there is good reason to believe that many of the gulches and some of the other protected land along the Koolau coast may also be used for rubber. The Nahiku Company is dependent mainly on the Ceara Rubber (*Manihot glaziovii*) but is also experimenting with other rubber producing trees, notably Central American Rubber (*Castilloa elastica*) and Para Rubber (*Hevea brasiliensis*).

There is at present little attempt at the systematic cultivation of any other crop in the Koolau District, except in a small way to the sea. A little grazing is carried on by individuals but this is also confined to the lower lands.

After careful consideration the trail bordering the Koolau Ditch, with its Eastern and Western additions—respectively the "Nahiku Extension" and the "New," or "Upper Hamakua Ditch"—has been taken as the lower boundary of the Koolau Reserve. The trail is taken rather than the Ditch itself because the Ditch is a boundary always in evidence, whereas the Ditch not infrequently becomes a tunnel and is lost to sight. When the tunnel runs through a ridge the trail follows around the hill, usually on a nearly even grade, elsewhere the trail borders the ditch itself. The trail is a well made and permanent improvement and being constantly in use by the ditch tenders forms a definite and easily maintained boundary. The Ditch itself where uncovered prevents cattle from entering the forest above, while short stretches of fence across the ridges above the tunnels or along the trail will usually serve to keep them out at

these points. Frequently also the topography makes fencing unnecessary.

At present the native forest comes in many places much below the lower line of the Proposed Reserves. The part of the water shed lying between the Koolau Ditch and the ditches nearer the sea is accordingly protected; an important matter as not a little water is developed from springs below the line of the Upper Ditch. Under the existing leases this forest is in a large measure protected from cattle by clauses requiring fencing; especially by a forest fence built along the Government Road under a provision of the Koolau Forest Lands lease.

On the private land which they lease or own in fee the Baldwin interests keep the cattle out and jealously maintain the forest cover, while at the west end of the Reserve on the land of Opana, and extending therefrom into the District of Hamakua-poko, extensive artificial plantations of forest trees have, as stated above, been started by the Baldwins to replace the natural forest cover of former years.

Until there is a very decided demand for the Government land between the ditches for some form of agriculture which gives more than ordinary promise of success it is believed that the best interests of the Territory will be served by maintaining the forest cover down to the lines of the lower ditches.

From the Hana-Koolau District line to the Halehaku gulch and between the lower line of the Proposed Forest Reserve and the ocean the gross area is approximately 22,500 acres. Of this a good portion is Government land so that even with this forest area excluded there is ample room for all the development likely to occur for a considerable time to come, particularly as rubber does best only at the lower elevations.

But in settling on Forest Reserve boundaries it is desirable to draw lines which shall be as definitely fixed as reasonably may be. For a permanent lower boundary the line of the Koolau Ditch seems to come nearer to meeting the requirements than any other which could be chosen. It is permanent, definite and in itself much of the way a barrier against cattle. It has accordingly been adopted. The elevation of the Koolau Ditch at the Eastern end of the Reserve is about 1300 feet, at the West end about 1200 feet.

On the upper side of the Reserve between the top of the

woods and the crest of the crater there is a belt of open land. This is an area of light precipitation compared with the section below but as a number of streams head therein, and as the area while suitable for grazing is inaccessible, it is believed that it is the wisest policy to include it in the Reserve. A good share of this area, especially the Western half is on the privately owned land of Haiku-uka belonging to the Haiku Sugar Co. and Paia Plantation. The elevation of the line of the top of the woods is between 6000 and 7000 feet. The crest of the crater, where the Reserve line follows it on Government land is from 7500 to 8000 feet. It is confidently believed that at this elevation coniferous trees from the temperate zone could be grown to advantage. Such a plantation would be of great interest and in time of economic value.

A band of wild cattle at present wanders at large in the Koolau forest. It is thought that these animals work for the most part near the upper edge of the woods. No estimate of the number can be given but the band is not supposed to be a very large one. Systematic hunting should be undertaken to drive out or exterminate these cattle.

The lands within the Koolau Forest Reserve may for the present purposes be considered as divided into seven tracts, which beginning at the East may be described as follows:

- (1) Hana Forest Tract: The portion of the Government land known as the Hana Forest Tract extending into the Koolau District; under lease to Hana Plantation Co. (Lease No. 492).
- (2) Nahiku Forest Tract: Government land; Water rights leased to Hana Plantation Co. "Koolau Water Rights." (Lease 520 B).
- (3) Koolau Forest Lands, Tract No. 2: Government land leased to H. P. Baldwin. "Koolau Forest Lands." (Lease No. 538).
- (4) Koolau Forest Lands, Tract No. 1: Government land leased to H. P. Baldwin. "Keanae-Wailua 1 and 2." (Lease No. 539).
- (5) Honomanu: Government land, leased to Hawaiian Commercial and Sugar Co. (Lease No. 52).

- (6) West Koolau Forest Tract: Government land; Water rights leased to Haiku Sugar Company and Paia Plantation Co. "Hamakua and Hamakualoa Water Rights." (Lease Nos. 267 B and 475).
- (7) Halehaku, Peahi, Opana and Haiku-uka: Fee simple lands owned or controlled by the Baldwin interests; lying to the South and West of the Koolau Forest Tracts.

Of the above it is proposed that the Government set apart the lands covered by water leases, namely, the Nahiku Forest Tract and the West Koolau Forest Tract, these being the only Government lands within the Reserve not now under lease or on which the leases are within two years of expiration.

For the reasons outlined above, which may be summarized in the statement that the protection of the forest covering the Koolau water shed is essential to the best interests of the Territory, I recommend that the Board approves the creation of a Forest Reserve within the boundaries described below, and that it requests the Governor to set apart in accordance with law, the unleased Government lands lying therein; and further, that steps be taken to secure the co-operation of the private interests holding land within the Koolau Reserve boundaries, that the objects for which the Reserve is made may be fully realized.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

HALELEA FOREST RESERVE—KAUAI.

Honolulu, T. H., July 29, 1905.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:

In July, 1904, I reported upon a proposition to create a Forest Reserve in the District of Halelea, Island of Kauai, but as certain maps and descriptions illustrative of the area were not then ready the Board postponed action by laying the report upon the

table. The desired information being now at hand I suggest that the matter be taken up. To this end, I have re-written my report of last year on the basis of the additional data. My original information was obtained during visits made to the District in May and June, 1904. The revised report I have the honor to submit herewith:

The area embraced by the proposed Halelea Forest Reserve includes the greater part of the District of Halelea above the belt of agricultural and grazing land near the sea.

The lower line may be roughly described as following the foot of the steep slope of the main ridges. The other lines follow the ridges making the natural boundaries of the Halelea District.

The object of the Reserve is to protect the forest on the Halelea water shed.

It is true that in a large measure the character of the topography renders artificial forest protection unnecessary but there are portions of the District where man can assist Nature. For this reason the Reserve is created.

The District of Halelea lies on the North side of the Island of Kauai. Next to the Na Pali District which it adjoins on the East and which it much resembles, Halelea has the most rugged topography on the Island. Sharp, steep sided mountain spurs rise abruptly from the narrow, deeply cut valleys and run back to the ridge culminating in the peak of Waialeale, the center and backbone of the Island. These spurs and high ridges catch and hold the moisture laden trade wind clouds and as a consequence the precipitation on the mountains is heavy and during a good part of the year very nearly continuous.

The steep grade of the valleys makes the streams torrential in character and as the nearly constant rainfall on the slopes above keeps them well filled, the District is one which has great possibilities for the development of water power. This indeed is its chief value for the topography of the greater part of Halelea precludes other economic use.

There is little agricultural land in Halelea, and the best of that—the lower portions of the lands of Kalihikai and Kalihiwai—belongs topographically to the District of Koolau rather than to Halelea. A narrow strip of open agricultural land extends along the shore and runs up for a way into the valleys.

Between this area and the foot of the precipitous slope of the main ridges is another narrow belt of grazing land. Outside of these areas, so far as is now known, there is, with one exception, no other agricultural land in the District.

The exception is in the Hanalei Valley where recent explorations by Messrs. W. E. Rowell and F. E. Harvey have disclosed an area of land apparently suited for settlement and general agricultural purposes. This tract contains approximately 3000 acres and is situated in a basin some little distance above the Hanalei Valley Homestead Lots, recently opened. This area, although within the boundaries of the Proposed Reserve, should I think be excluded from the Reserve, so that when the right time comes it may be opened for settlement without the necessity of changing the boundaries or otherwise modifying the Reserve.

To further facilitate the development of this area a clause might well be inserted in the proclamation, issued by the Governor, reserving rights of way across the Forest Reserve to it. This is not really necessary as the law already provides for rights of way but it would do no harm to emphasize the point.

The elevation of the central and highest peak on Kauai, Mount Waialeale, is not great (5240 feet), so that all the ridges are covered with vegetation to the top. The forest is probably made up largely of Ohia Lehua (*Metrosideros polymorpha*), in mixture with other trees but its inaccessibility makes a more exact statement impossible at this time.

A tangle of various ferns, climbing vines and other undergrowth covers the steep slopes with a coat of vegetation made up of a bewildering number of shades of green. During trade wind weather, this wonderful background is lighted up by innumerable water falls and cascades which add greatly to the charm and picturesqueness of the District. From the village of Hanalei the view toward the mountains is one that is hard to surpass. With its other attractions this locality has great possibilities as a tourist resort if properly advertised and developed by an enterprising company.

On the lower slopes the forest is more open and the undergrowth somewhat different in character. Masses of Ieie vine (*Freycinetia arnotti*) growing over the surface and running up into the trees make it almost impossible to penetrate this forest

save as one cuts his way with a cane knife, and even so he is soon confronted by the almost perpendicular sides of the neighboring cliffs. Lower down are great patches of the Stag Horn fern or Uluhi (*Gleichenia dichotoma*) covering the open ridges and coming down to and into the grazing belt.

The development of water power has already begun in Halelea. The stream in the Wainiha Valley is being harnessed to supply power which will be carried by wire across the mountain to be used on the Koloa, McBryde and Lihue Plantations. The streams in certain of the other valleys could also be developed for power and there is a possibility as well that some of the water might be carried out onto the low lying lands in the adjoining Districts, either by open ditches or by tunnels under the mountain, to irrigate large areas of land which at present do not reach their highest possible productivity.

By the creation of the Proposed Reserve a large area will be set apart for forest purposes which while naturally protected can be better administered if brought under the control of the Board of Agriculture and Forestry. Much of the way along the lower boundary the question of fencing is solved by the local configuration, precipitous slopes rendering artificial boundaries unnecessary. Where fencing is required it is usually on private lands which can probably be arranged for under the terms of co-operation entered into by the Board and the interested persons. In any event having been created a Reserve there is much more chance of obtaining money for fencing than if the lands were merely unleased Government property.

There is no objection on the part of the companies and individuals interested in the privately owned lands within the boundaries to the creation of the Reserve. On the contrary these interest are distinctly in favor of the project. The land of Wainiha belongs to a Hui made up of a large number of individuals. The Hui has leased the water rights for a long term of years to the Kauai Electric Power Company, which as its existence depends on the utilization of the water in the valley is fully alive to any advantages which may come from the protection afforded by the Forest Reserve.

The lands of Lumahai and Waipa belong to the Bishop Estate, which has signified its intention of co-operating with the Government in establishing and maintaining this Reserve. These

lands do not run up as far as do Wainiha and Hanalei—the Government map to the contrary notwithstanding—but Luma-hai at least is important because containing a stream which might under certain conditions be utilized for irrigation or power.

Waioli is a Government land not now under lease. Hanalei also belongs to the Government and is not now covered by any lease.

The land of Kalihiwai belongs to Hon. A. S. Wilcox, who has signified his willingness and intention to co-operate with the Board on much the same terms as the Bishop Estate. Kalihi-kai also belongs to Mr. Wilcox but as only four or five acres of this land come within the Reserve boundaries it may be neglected here.

In view of the above facts and reasons, I therefore recommend that the Board request the Governor to declare the area within the boundaries below a Forest Reserve and to set apart as compartments thereof after the hearing required by law, the portions of the Government lands of Waioli and Hanalei, lying within the Reserve boundaries. And I further recommend that steps be taken to secure the co-operation of the private interests owning land within the Reserve, that the objects for which it is set apart may be more fully reached.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

In accordance with a statement made last month in the editorial on the Hilo Forest Reserve, Island of Hawaii, the formal proclamation by Acting Governor Atkinson defining the boundaries of the Reserve and setting apart the unleased Government lands lying therein, is here given:

The proclamation was officially published in the Hilo Tribune of August 1st and in the Hawaii Herald of August 3rd, 1905.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE, HILO DISTRICT,
ISLAND OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands lying between the 1881 Lava Flow back of Hilo Town and the Hilo-Hamakua District line, and between a line drawn approximately parallel to the coast (having an elevation of about 1750 ft. at the South end and an elevation of about 2000 ft. at the North end) and a line approximately along the top of the woods, in the District of Hilo, Island of Hawaii, Territory of Hawaii, more particularly described as follows, viz.:

LOWER LINE.

"Beginning at a point on the extreme lower end of the Laumaia Branch of the Lava Flow of 1881, this point being on the boundary line between the lands of Punahoa 1st and 2nd. Its co-ordinates referred to the Halai Survey Reference Station, being 8669 feet South, 24,934 feet West, the boundary runs by the true meridian:

1. N. one degree 41 minutes E. 4555 ft. crossing the various subdivisions of the land of Punahoa 2nd to a point on the boundary line of Punahoa 2nd with the land of Piihonua (Government), the co-ordinates of the said point referred to the Halai Survey Reference Station, being 4432 ft. South, 24,809 ft. West; thence crossing the land of Piihonua;

2. N. 21 degrees 32 minutes E. 4247 ft. to junction of the Hookele-kele Stream with a branch from the North, the co-ordinates referred to the Halai Survey Reference Station, being 480 ft. South, 23,250 ft. W.; thence following up the middle of said branch which forms the present South boundary of the Hawaii Mill Company's Plantation to the Southwest angle of the same, the direct bearing and distance to said point being

3. N. 62 degrees 9 minutes W. 6165 ft., the co-ordinates referred to the Halai Survey Reference Station, being 2400 ft. North, 28,700 ft. West, thence across the lands of Piihonua and Waiau (Government)

4. N. 27 degrees 47 minutes E. 8538 ft. to a point in the Awehi Stream, the co-ordinates referred to the Halai Survey Reference Station, being 9950 ft. North, 24,720 ft. West, thence down the middle of the Awehi, also called the Waiau Stream, to the junction of same with the Aale Stream, the direct bearing and distance being

5. S. 59 degrees 08 minutes E. 5964 ft., the co-ordinates referred to the Halai Survey Reference Station, being 6890 ft. North, 19,600 ft. West, thence across the lands of Pueo (Hilo Sugar Co.), Kalalau and Alae (Estate B. Pauahi Bishop).

6. N. 4 degrees 36 minutes E. 6545 ft. to the Southwest angle of Kawaiki Homestead, Lot No. 40, at the junction of the Maili and Pahoa Streams, the co-ordinates referred to the Halai Survey Reference Station, being 13,405 ft. North, 19,075 ft. West, thence following up the middle of the Maili Stream and gulley forming the South boundary of the Kaiwiki Homestead Tract, the direct bearing and distance being

7. N 81 degree 10 minutes W. 18,130 ft. to the Southwest angle of Kaiwiki Homestead, Lot No. 73, the co-ordinates referred to the Halai Survey Reference Station, being 16,189 ft. North, 37,001 ft. West, thence along West boundary of Kaiwiki Homestead, Lot No. 73

8. N. 5 degrees 58 minutes W. 2168 ft. to Northwest angle of Kaiwiki Homestead, lot No 73, at a point on the South Pali of the Honolii Stream called Waikee the co-ordinates referred to the Halai Survey Reference Station, being 18,345 ft. North, 37,226 ft. West, thence along North line of Kawiki Homestead Tract to the Northeast angle of Kaiwiki Homestead Lot No. 51, the direct bearing and distance being

9. S. 34 degrees 02 minutes E 15,166 ft. to said Northeast angle the co-ordinates being referred to the Halai Survey Reference Station being 16,768 ft. North, 22,125 ft. West, thence across the land of Kikala (Estate B. P. Bishop).

10. N. 18 degrees 58 minutes E. 986 ft. to junction of the Honolii and the Pohakupaa Streams, thence across the land of Paukaa (Onomea Sugar Company)

11. N. 1 degree 10 minutes 30 seconds 3145 ft. to a point on the boundary line between Paukaa and Pahoehe (Estate B. P. Bishop), thence across the land of Pahoehe

12. N 1 degree 10 minutes 30 seconds 3605 ft. to a point in the middle of the Pahoehe stream the co-ordinates referred to the Halai Survey Reference Station being 24,460 ft. North, 21,671 ft. West, thence to and across the land of Papaikou (Onomea Sugar Co).

13. N. 2 degrees 29 minutes E. 6615 ft. to a point in the Alakahi Stream marking the West angle of the land of Puumoi (Onomea Sugar Co), this point being distant 1064 ft., bearing South 86 degrees 43 minutes E (True) from an X cut in the rock at the Waiemi Falls, the co-ordinates referred to the Kauku Survey Reference Station being 11,271 ft. North, 1080 ft. West, thence across the lands of Alakahi, Mokuoneki and Kahalii (Onomea Sugar Co.)

14. North 4491 ft. to a point on the boundary of Kaalii and Onomea (Onomea Sugar Co.) the co-ordinates referred to the Kauku Survey Reference Station being 6780 ft. South, 1085 ft. West, thence across the land of Onomea.

15. N. 14 degrees 23 minutes W. 3251 ft. to head of the land of Kawainui (Government) the co-ordinates referred to the Kauku Survey Reference Station, 3632 ft. South, 1803 ft. West, thence across the land of Makahanaloa (Pepeekeo Sugar Co.) to and along the upper limits of the Honomu Homestead Lots as shown on Government Survey Registered Map No. 2296 to the South Pali of Kolekole Stream and up said Pali to a point, the co-ordinates of which referred to the Kauku Trig. Station

are 5250 ft. North and 5000 ft. West, the direct bearing and distance between the initial and final points, being N. 19 degrees 17 minutes W. 9409 ft, thence across the lands of Kaiwika and Hakalaui (Government), Hakalaunui (Hakalau Sugar Co.). Kamae (Government), Umauma (Estate B. P. Bishop), Opea (Government), Honohina (Liliuokalani) and Nanue (Hakalau Sugar Co.)

16. N. 22 degrees 14 minutes W. 22,361 ft. to the South angle of the Kahuku Homestead Lot No. 16 the co-ordinates referred to the Puuohai Survey Reference Station being 13,710 ft. South, 1884 ft. West, thence across the land of Piha (Government)

17. N. 58 degrees 19 minutes W. 1519 ft to a point in the Waikamalu Stream the co-ordinates referred to the Puuohai Survey Reference Station being 12,912 ft. South, 3177 ft. West, thence up the Waikamalu Stream which forms the East boundary of the Maula Gehr Settlement Association Tract to the Southeast angle of Lot No. 67 of said Tract, the direct bearing and distance being

18. S. 67 degrees 58 minutes W. 10,260 ft. to aforesaid point, the co-ordinates referred to the Puuohai Survey Reference Station being 16,761 ft. South, 12,687 ft. West, thence along top of Gehr Settlement Association Lots No. 67, 68, 69 and 70

19. N. 34 degrees 55 minutes W. 2233 ft to Southwest angle of Lot No. 70 the co-ordinates referred to the Puuohai Survey Reference Station being 14,931 ft. South, 13,965 ft. West, thence along the boundary of Mauluanui (Mrs. Robertson)

20. N. 37 degrees 37 minutes E. 5852 ft. to a natural divide or fork in the Pohakupuka Stream called Kepaniwai the co-ordinates referred to the Puuohai Survey Reference Station being 10,306 ft. South, 10,403 ft. West, thence along the boundary of Maulua and Gehr Settlement Association Lots.

21. N. 2 degrees 20 minutes W. 3062 ft. to a point in the Makaliiloa Stream 150 ft. above the Hauwanawana Falls, the co-ordinates referred to the Puuohai Survey Reference Station being 6347 ft. South, 10,564 ft. West, thence across Maulua

22. N. 29 degrees 14 minutes W. 4632 ft. to a point on boundary of Mauluanui and Weloka (Government), this point being distant 700 ft. and bearing South 39 degrees 16 minutes West (True) from an Ohia tree marked

Δ L

at edge of old water ditch, the co-ordinates referred to the Puuohai Survey Reference Station being 2306 ft. South, 12,826 ft. West, thence across the lands of Weloka, Kealau and Kapehu (Government)

23. N. 64 degrees 35 minutes W. 3371 ft. to Southeast angle of Laupahoe Homestead, Lot No. 39, the co-ordinates referred to the Papaloa Survey Reference Station being 10,155 ft. South, 2,480 ft. West, thence along South line of Laupahoe Homestead Tract

24. N. 61 degrees 25 minutes W. 11,631 ft. to Southwest angle of Laupahoe Homestead, Lot No. 7, the co-ordinates referred to the Papaloa Survey Reference Station being 4413 ft. South, 13,019 ft. West, thence across the lands of Puualaea, Kiilau and Laupahoe 1st and 2nd (Government)

25. N. 58 degrees 00 minutes W. 5097 ft. to a point on the boundary of Waipunalei (S. Parker), the co-ordinates referred to the Papaloa Survey Reference Station, being 1712 ft. South, 17,335 ft. West, thence across the land of Waipunalei.

26. N. 86 degrees 16 minutes W. 1997 ft. to the Southeast angle of Section 13 Kahooahuna, the co-ordinates referred to the Papaloa Survey Reference Station being 1582 ft. South, 19,331 ft. West, thence across top of Section 13 Kahooahuna to point in middle of Mauiana gulch on boundary of Humuula

27. N. 46 degrees 24 minutes W. 1786 ft. to the Southwest angle of Section 13, thence down middle of the Mauiana gulch and boundary of Humuula (Government)

28. N. 27 degrees 25 minutes E. 2986 ft. to a point in the Mauiana gulch, the co-ordinates referred to the Humuula Survey Reference Station, being 8777 ft. South, 2470 ft. West, thence across the lands of Humuula and Ookala.

29. N. 61 degrees 35 minutes W. 4661 ft. to a pool at foot of Falls in the Kauula gulch called Paeoapu, said point forming the Southwest angle of the land of Ookala and on the boundary between the Hilo and the Hamakua Districts, the co-ordinates referred to the Humuula Survey Reference Station being 6559 ft. South, 6507 ft. West, thence up along said boundary between the Hilo and Hamakua Districts to an X cut in the rock ledge near the middle of the Kauula gulch at the old Keanakolu-Waimea trail crossing, the said gulch at this point being the boundary of the Hilo and Hamakua Districts, the co-ordinates of the said point being North 13,204.9 ft., East 3,301.4 ft., referred to the "Puukalepa" Terr. Survey Station.

UPPER LINE.

30. Beginning again at the initial point the boundary runs in a general westerly direction up and along the northern edge of the various lava flows to the point described in Bd. Cert. No. 53, Piihonua, as Mawae, the mark being a large monument of stones erected on the top of bank of the main Aa lava channel of the 1855 Lava Flow, situated a little above the bend of the trail over the lava, where it leaves the Pahoehe crossing the Aa channel, and about 700 ft. South of the entrance of the trail into the Halealoha opening the co-ordinates being South 40,908 ft., East 6350.0 ft. referred to the "Aahuwela" Survey Reference Station, thence by true azimuths

31. 195 degrees 42 minutes 40,366 ft. across the land of Piihonua (Territory of Hawaii) to a point on the South boundary line of Paukaa (Onomea Sugar Co), the co-ordinates being South 2040 ft., East 17,273.2 ft. referred to the "Aahuwela" Territory Survey Station.

32. 215 degrees 55 minutes 30 seconds 3436.7 ft. across the land of Paukaa, to a point on the South boundary of Papaikou (Onomea Sugar Co.), the co-ordinates being North 742.2 ft., East 19,289.7 ft. referred to the "Aahuwela" Terr. Survey Station.

33. 178 degrees 03 minutes 43 seconds 4791.0 ft. across the land of Papaikou to a point on the South boundary of Makahanaloa (Onomea Sugar Co.), the co-ordinates being North 5983.3 ft., East, 19,135.0 ft. referred to the "Aahuwela" Terr. Survey Station.

34. 168 degrees 01 minutes 55 seconds 4783 ft. across the land of Makahanaloa to a point on the South boundary of Hakalaunui (Hakalau Sugar Co.), the co-ordinates being 250.7 ft. South, 7278.2 ft. East referred to the "Kaloaloe" Terr. Survey Station;

35. 179 degrees 26 minutes 56 seconds 9294.0 ft. across the land of Hakalau to a point on the South boundary of Honohina (Liliuokalani), the co-ordinates being North 9032.3 ft., East 7188.8 ft. referred to the "Kaloaloe" Terr. Survey Station;

36. 114 degrees 09 minutes 02 second 8695.7 ft. across the land of Honohina to Northwest angle of same, at a Koa tree blazed H (old mark) re-marked



standing on the north bank of the Nahui gully, about 50 ft. East or makai of the Hopuwai-Keanakolu trail where it leaves the gully, the co-ordinates being North 12,590.4 ft., West 745.5 ft., referred to the "Kaloaloe" Terr. Survey Station;

37. 183 degrees 19 minutes 4580 ft. along West or mauka line of Piha (Territory of Hawaii) bordering Humuula (Territory of Hawaii) to Northwest angle of Piha, at a point on the Hopuwai-Keanakolu trail where it leaves the brush and enters an open flat covered with black sand, in the middle of which has been erected a large mound of stones, called Kahuwai, the co-ordinates of the aforesaid Northwest angle of Piha being South 7867.3 ft., East 10,415.5 ft. referred to the "Puukalepa" Terr. Survey Station;

38. 109 degrees 23 minutes 6208 ft. along West or mauka line of Mauluanui (Mrs Sara Robertson) bordering the land of Humuula to Northwest angle of Maulua Nui at a Koa tree



surrounded by a mound of stones, a little East of the Hopuwai-Keanakolu trail, and at bend of the same into the Kaiaki gully, the co-ordinates

being South 1765.3 ft., East 9271.5 ft. referred to the "Puukalepa" Survey Station.

39. 172 degrees 02 minutes 12 seconds 4125 ft. along West or ~~main~~ boundary of Laupahoehoe (Territory of Hawaii) bordering the land of Humuula, to the Northwest angle of Laupahoehoe at the crossing of the Hopuwai-Keanakolu trail, over the "Keahuaai" or "Douglas Pits" gully, the co-ordinates being North 2320.0 ft., East 3700.0 ft. referred to the "Puukalepa" Terr. Survey Station.

40. 229 degrees 55 minutes 4638 ft. along the North boundary of Laupahoehoe bordering Humuula to a mound of stones by a Koa tree marked "POLOKA" at West brink or edge of a pool of water called "Kalaukahoi" this forming the Southwest angle of the land of Waipunalei (Samuel Parker), the co-ordinates being North 5306.4 ft., East 12,248.6 ft., referred to the "Puu Kalepa" Terr. Survey Station.

41. 163 degrees 03 minutes 03 seconds 4502.0 ft. along West or main line of Waipunalei bordering Humuula to Northwest angle of Waipunalei at a point in the middle between three Koa trees marked H, X and W respectively, re-marked



distant 1241 ft., bearing 282 degrees 00 minutes from the post set as a Survey Reference Station on the top of the Lehohinu Puu, the co-ordinates being North 9613.4 ft., East 10,936.0 ft. referred to the "Puu Kalepa" Terr. Survey Station;

42. 142 degrees 57 minutes 45 seconds 4374.0 ft. across the land of Humuula to an X cut in the rock ledge near the middle of the Kaula gulch at the old "Keanakolu-Waimea" trail crossing, the said gulch at this point, being the boundary of the Hilo and Hamakua Districts, the co-ordinates of the said point being North 13,204.9 ft., East 3301.4 ft. referred to the "Puu Kalepa" Terr. Survey Station.

Total area 110,000 acres, more or less."

And I do hereby set apart as a Forest Reserve those portions of the Government lands known as the Ahupuaa of Honomu and Papaaloa Forest section (embracing the Government lands between Maulua and Waipunalei), lying within the said metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused (SEAL) the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 24th day of July, A.

D. 1905.

A. L. C. ATKINSON.

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THE HAWAIIAN FORESTER AGRICULTURIST

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SEPTEMBER, 1905

No. 9

CO-OPERATION IN THE PINEAPPLE INDUSTRY.

To the Editor of the Hawaiian Agriculturist and Forester.

Dear Sir: The pineapple industry of these Islands, as it stands today, is the result of some fifteen years of experiment and extension. The pioneers in the industry are now face to face with the work of those who, profiting by the experience of others, have largely avoided the errors of earlier cultivators, with the result that the past five years have seen a large addition to the acreage under cultivation. The agricultural end seems well in hand and providing wise counsels prevail future years will see the development enormously increased. If the growing of pineapples is to be a profitable venture, the preparation and marketing of the fruit deserves and demands the earnest consideration of the growers.

Up to the present time the marketing of fresh fruit has been accomplished by the individual grower forwarding to some commission house at the coast the product of his ranch as it matured. The condition of the fruit market in general and the trade in pineapples in particular entered but slightly into the calculations of the man with fruit that must be disposed of on hand. Thus, at one season or another, all shippers of fresh fruit have been more or less seriously "nipped" with the result that at times the freight expenses have equalled and in some cases even exceeded the price obtained.

Market conditions on the mainland are such that we have not as yet supplied even the yearly increase in consumption of the canned fruit; but with the development now in progress it is only a question of a very short time when Hawaiian canned fruit will be displacing the product of Singapore, the West Indies and Florida, and those countries which hitherto have enjoyed a monopoly of the trade. When this takes place will come the real test as to the future of the pineapple industry in this Territory.

Comparing the average product of the several canneries now operating in these Islands with that from other countries the conclusion must be that the local fruit is superior to all other in flavor, color, uniformity, and freedom from eyes and specks. Finally in the style of package and label the Hawaiian product compares favorably with the finest mainland canned goods.

To this extent at least—the local canning business has been wisely handled, and it is the duty of all interested to see that the standards thus created are not only maintained but if possible improved, a task which will increase in ratio with the increase in the number of canneries.

Already we experience the effects of the moderate competition of products of local canneries, and this factor of local competition is likely to be as effective in disposing of margins of profits and inviting a departure from established standards as could be the competition with goods from older sources of supply.

The inevitable consequences of such a condition, if permitted to develop would be most discouraging to those dependent on the industry, and this brings us to a consideration of the best course of avoiding such an undesirable condition of affairs. This must be sought in co-operation—and such co-operation as will permit the several conjoining elements to still retain their identity and individuality to the utmost possible limit.

To accomplish this the several growers throughout the group should enter into agreements placing the control of the business in the hands of a Board of Control representing the several interests thus conjoined. The purposes and objects of the Board would be as follows:

1st.—To establish an agent at the several distributing centers on the Pacific Coast for the disposal of fresh fruit.

2nd.—To fix, from time to time, a minimum price at which fresh fruit is to be sold.

3rd.—To regulate the disposal of fruits by a system of advance orders and such other means as would from time to time be deemed proper, or necessary to prevent the market price from dropping below the minimum while yielding same all the fruit it can consume, at or in excess of such minimum price.

4th.—To notify the several growers of the quantities of fresh fruit to be forwarded, the allotment for this purpose being based

on the amount of fruit each grower has ripening, as compared with the total for the period covered by the consignment.

5th.—Each grower to make his own selections of fruit and pack same under his own brand subject only to the condition of using a uniform package and to such regulations as would apply uniformly to all growers.

6th.—All goods destined for one distributing point to go forward under one bill of lading to the Co-operative Co.'s agent.

7th.—Separate account sales to be rendered for each brand forwarded and settlements to be effected monthly.

The surplus fruit in all cases to go to the cannery to which the grower is tributary, under agreements as follows:

Fruit to be graded into three classes, 1st—That suitable for canning as 2½ lb. sliced; 2nd—That suitable for 2 lb. sliced, and 3rd—Such as is unsuited for either of above, for use as “grated.”

In the several grades, the price should be fixed yearly or oftener if deemed desirable, at which the fruit would be accepted at the cannery; 25% of the price to be paid at the time of delivery, and the balance in installments covering a fixed period.

Only the fruit of such growers as abide by the fresh fruit agreement, to be accepted at the cannery.

The canned product to be disposed of through a single distributing agency. Each cannery having its particular brand and label for its several products.

Agency agreements would contemplate separate account sales for each cannery and settlements to be made at stated periods.

Each group of growers having access to a cannery to be responsible, in ratio to the amount of fruit furnished for canning for any debts of the cannery and to join in like proportion in any surplus earnings.

In respect to canneries, I would advocate a single cannery for this Island—centrally located—if possible at tide water and equipped with up to date automatic machinery for can making and as far as practicable for fruit manipulation.

The canneries now located here would be ample for the requirements of Hilo and some other fruit growing center, disposition being thus made to the advantage of all interested in the proposition.

The main purpose of such a plan of organization as herein outlined, is to keep active as many competitive features as

possible both in the production and canning of the fruit; the individuality of both growers and canneries is preserved while insuring them a just remuneration for their industry and outlay.

Among the benefits to be derived from such association may be mentioned the economies resulting from large purchases of like supplies of whatsoever kind. A better supervision and consequent greater production through improved methods of cultivation and canning.

Employment of an expert chemist—something sorely needed by every canning establishment but impossible to secure (owing to the expense) by the individual cannery. Such a man would be invaluable in coaching superintendents along right lines—suggesting new lines to work on and determining the best uses to be made of what are now waste products.

Illustrating one of the possibilities of co-operation on this Island an automatic can-making plant located anywhere at tide water would, in a single season's run pay for itself in freights saved from the importation of ready-made cans in like quantities, to say nothing of the labor saving features of this class of machinery; and what is said of can-making could be closely duplicated in the several operations necessary to the canning of fruits.

Finally as to finances. A comprehensive scheme such as could be outlined and carried through along lines herein proposed would present such manifest advantages and economies over methods now in vogue—as would with proper guarantees from the growers—bring out all the financial assistance necessary to inaugurate and perfect the system.

I present this outline from my view point in the hope that it may assist in bringing about a more desirable state of affairs than existing conditions promise for one of our “minor” industries.

What profits an industry if it supply the entire market demand for its product and reap no reward except an occasional “Irish” dividend?

Thanking you for the opportunity for the use of your columns,

I am yours for diversified industries,

JOHN EMMELUTH.

POSSIBILITIES OF RUBBER CULTURE IN HAWAII.

BY R. H. ANDERSON.

But four varieties of rubber producing trees are of any commercial value, viz: *Hevea Brazilliensis* (Para), *Manihot Glaziovii* (Ceara), both native of Brazil, *Castilloa Elastica* (both *Lactiflua* and *Nicoyensis*) of Mexico and Central America, and the *Ficus Elastica* of Assam.

The Ceara is the only one of these planted in Hawaii until within the past year.

In 1898, some seeds were obtained by the Bureau of Agriculture and distributed to various parties throughout the Islands for planting. In spite of the fact that no care has ever been given them, and varied as the conditions are in the different localities, those which have escaped being eaten by horses and cattle have grown remarkably well.

In one group planted by Hugh Howell at Nahiku, Maui, the trees measure 48 inches in girth at a height of 3 feet from the ground. They have had one systematic tapping, yielding from 5 to 8 oz. of dry rubber. (They can be tapped twice a year.)

In the State of Ceara, Brazil, the habitat of the species, the tree is found growing at high elevations on the dry, stony, barren slopes of the mountains, which has given rise to the idea that it will only do well under desert-like conditions.

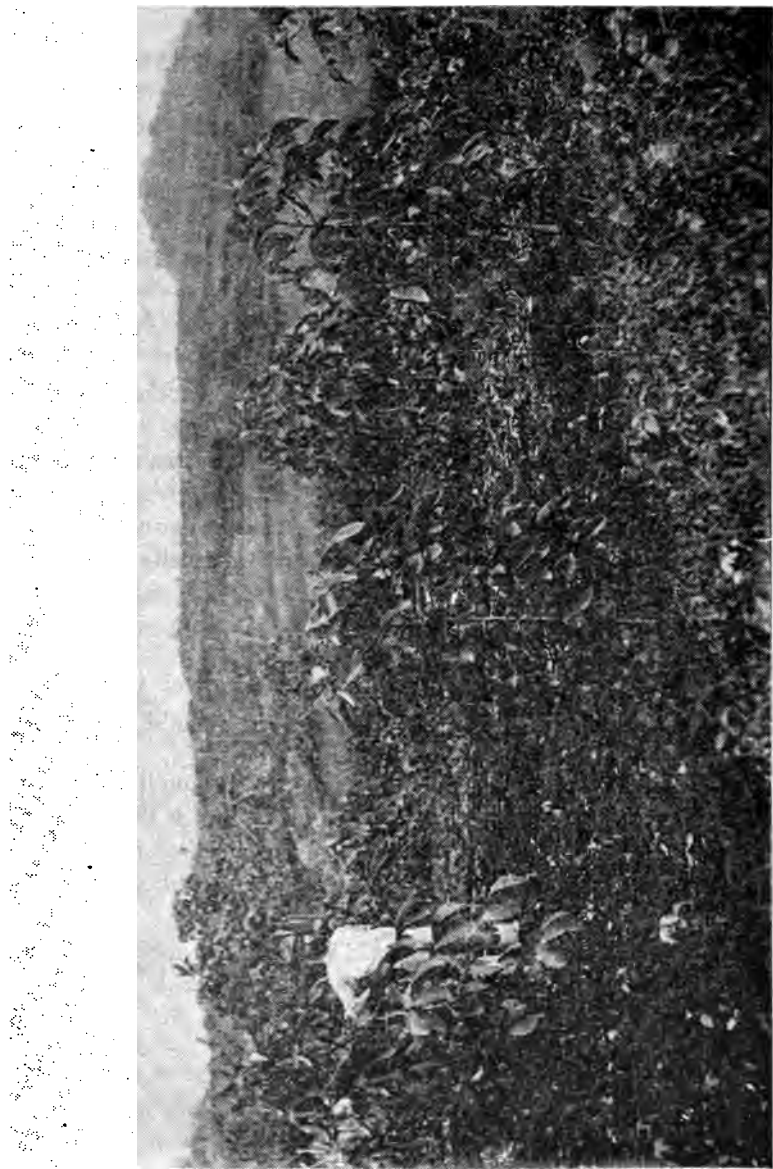
So general is this idea that many thousand trees have been planted in other countries in places so sterile that no other vegetation could exist, with the natural consequence that little or no rubber was obtained after they had struggled along to maturity.

However, when found growing in the same localities with *Hevea*, as along the upper Amazon, it is found to yield about one-half as much. The native tappers make no distinction, tapping both kinds as they come to them, mixing the milk and coagulating it in large balls, known to the trade as "Para hams."

Where this tree grows alone it is impossible to coagulate the milk in this form for it congeals too quickly, so is allowed to run down the tree and coagulate in streaks as it runs. This is known as "scrap" or "Manicoba," and is the only form in which the *Manihot* rubber reaches the market unmixed with that from *Hevea*.



W. H. Hight.



Rubber Trees at Nahiku, Six Months Old, Six Feet in Height. --

The objections to the cultivation of the Ceara are:

1st.—It is quite expensive to prepare the seeds to insure germination.

2nd.—The tree has two barks; the inner one very soft and smooth, while the outer is hard and shaggy, and has to be stripped off like birch bark before tapping, thus adding to the expense of collection.

3rd.—As compared with Hevea the yield is small.

The points in favor of it are:

1st.—That it will yield in paying quantities during the third year from planting.

2nd.—Yielding while very young the trees may be planted as closely as 700 per acre.

3rd.—They may be planted on stony ground if other conditions are favorable.

4th.—The seeds retain their vitality for more than a year and can be shipped anywhere.

5th.—All the trees bear seed, the first crop at two years of age. So much for the variety already grown to maturity, in Hawaii.

HEVEA BRAZILLIENSIS.

The most important and profitable variety of all is the *Hevea Brazillensis*, the habitat of which is from the mouth of the Amazon to the slopes of the Andes, in Peru.

It is a very tall tree with a single, soft, smooth bark. The branches are small and high up with leaves much the same size, shape, and color as the mango, growing in clusters of three. The seeds are as large as walnuts and retain their vitality but a short time, making them difficult to transport.

Eighty-five per cent. of the world's supply of rubber is obtained from these two varieties. When in its crude state, Para rubber is pure and only needs washing to free it from dirt and particles of bark when it is ready to vulcanize.

CASTILLOA ELASTICA.

There are two kinds of *Castilloa*, the *Lactiflua* of Southern Mexico and Guatamala, and *Nicoyensis* of Nicaragua and Panama. It is a large, quickly, growing tree yielding at 6 years of age ordinarily. The branches are very large, growing horizon-

tally and hung with bright green leaves, eighteen inches long and as tough and thick as sole-leather.

The milk flows very freely, being 50% water. The rubber is black and sticky with very little elasticity, and owing to the great amount of resinous matter in it, the price has always been about 40% less than that of Para; but owing to the great increase in the use of electrical machinery, the price has risen lately as the *Castilloa* is being principally used for insulating purposes requiring no elasticity.

It comes to the market in scrap, sheets, and balls. Some planters color it white in coagulating by mixing chalk or whiting with the latex, adding much to its appearance and overcoming the stickiness somewhat, making it more agreeable to handle. Its resinous qualities however, cannot be overcome, so that it will never bring a price equal to that of Para.

The *Castilloa* is not likely to prove a success in Hawaii, as it requires at least one hundred inches of rain during 6 or 7 months, and a dry season of at least 5 months. During the rains the tree stores the milk in its bark under no pressure, making the dry season necessary to shrink the bark, thus giving the necessary pressure to make it flow freely. These conditions are not to be found in Hawaii in conjunction with the other requirements.

The Nahiku Rubber Co., Ltd., was incorporated January 24, 1905, for the purpose of raising rubber trees at Nahiku, Maui. There are at this writing (Sept. 1), about 5,000 *Ceara* plants from 6 months of age and 10 feet in height, down to seedlings just coming up in the nursery. Six hundred *Castilloa* and 17,000 *Hevea* plants arrived from Ceylon during the first part of July.

Although it is yet too soon to give measurements of these, the fact that they all started to grow within three weeks of their arrival and have grown rapidly ever since, would indicate that the locality is as suitable for the growth of *Hevea* as for that of *Ceara*.

The plants were packed dry in kerosene boxes, about eight hundred in each, and as they were over 2 months in transit, their vitality was so low that many were thought to be dead that have grown even when nothing was alive but a portion of the root. These are the results of the work done by the company, and success is now assured.

It should be remembered that available localities possessing

suitable conditions are scarce in Hawaii; and those intending to plant should consider the importance of securing a man with practical knowledge of the business, which is of as much importance in planting rubber as in planting cane. Perhaps it would be well to wait until the Nahiku Co. has absolutely demonstrated that the industry is practicable in Hawaii, before engaging in the business on an extensive scale.

The requisite general conditions are:

1st.—Good, soft, deep soil, containing much humus, well drained either by slope or porosity, preferably the latter, with gravel or ash sub-soil.

2nd.—Continuous rainfall of a hundred or more inches throughout the year,—except for *Castilloa*.

3rd.—Complete protection from Kona and Trade Winds.

4th.—Elevation should be under 1800 feet, and the temperature should not go below 65.

While it is not absolutely proven that the trees would not do well under more adverse conditions, the industry should be started under conditions as favorable as possible, until it is firmly established as a success under such conditions. After which experiments will be excusable, and perhaps will prove to be of value.

A REPORTED NEW INSECTICIDE.

The Electrical Magazine recently describes a series of experiments for destroying injurious insects, which is said to have promised success. An engineer in Monaco while operating an electrical machine in the open air observed that metal rods inserted in the ground and connected with a dynamo of 110 volts, induced insects in the vicinity to leave their hiding places and to come hastily to the surface. Following these observations a series of experiments was conducted of which full details are not yet known.

An apparatus is mentioned, invented by a Russian, for killing injurious insects by electricity. A dynamo is so placed upon a hand car that no electricity is engendered while the car is standing still. When in motion the current enters the ground through the iron wheels of the car upon one side, and upon the other through the points of brushes of copper wire, which are fastened in the rear of the car so as to be a few inches above the ground.

The result is said to be that all insects in the vicinity of the copper brushes are killed as if by lightning.

1st 18th, 1900.

Ranch.

Sarpedon, 930



THE MODERN DAIRY HERD.

BY P. M. POND.

In Hawaii as elsewhere modern ideas are revolutionizing dairy methods. The dairy paper, the experiment station record, the Babcock Tester, and the individual milk record have each done their part in arousing a wholesome discontent with present conditions. Amidst the many opportunities for improvement, perhaps the most marked of all is the need of a better dairy cow.



In the States the average annual yield of milk per cow is estimated at about three thousand pounds, barely enough to pay expenses. There are herds, however, in which the average runs as high as six, seven or even eight thousand pounds per annum. Such herds are profitable and suggest large room for improvement among our dairy cows.

The development of a working herd of cows, vigorous in constitution, accustomed to feed, forage and climatic conditions, and

deep and persistent milkers, is a task of some difficulty, but amply worth the dairyman's trouble. Every cow in such a herd should be a business cow,—a cow that shows by her milk record and the Babcock test, a liberal profit for her year's keep, such a cow in short as Pua Ilima of the Kamehameha Schools dairy whose production in one year of 8843 pounds of milk was reported by Mr. Krauss in the March number of this magazine, or as cow No. 2 in the writer's herd with a production from Feb. 21st, when she entered the stable, to August 12th, 1905, a period a little short of six months, of 6,350 pounds 2 ounces, an average for the entire period of about seventeen quarts per day.

To build up a herd of high average production requires great care in selection and breeding, relentless culling of inferior stock, and unremitting attention to the maintenance of health and tone in every animal. It will not answer for example to take good care of a cow while she is in the milking shed, but the moment she is dried up preparatory to calving to turn her out on sparse pasture or subject to other unfavorable conditions. A good cow,—and it hardly pays to keep any other, requires good care three hundred and sixty-five days in the year.

Breed, to a considerable degree at least is a matter of adaptation to special requirements, or even of personal preference. A number of different breeds are represented in the local dairies. It is possible to find very fair specimens of grade Shorthorns and Holsteins. A herd of modern milking shorthorns, of such Holsteins as can be found in many places in the states, would make the average yield of our local dairies seem hopelessly small. Mr. Isenberg has imported some fine Red Poll cattle that seem to be doing well at his place at Waialae.

The importation of milch cows from the coast the past year has been very brisk. Among these have been a few fine milkers. However, in some cases animals imported immediately after calving, have owing to change of feed and climatic conditions at that critical time, suffered more or less seriously from digestive disorders. In such cases they will not do their best work till their next calving when they will be better acclimated. The expense and uncertainty of importing animals for milking purposes from the coast makes it extremely desirable that a better supply of fine stock should be raised at home. Other things being equal Hawaiian-grown stock should do better here than imported. It is to be hoped the day is not far off when dairymen will not be

compelled to resort to California for their supply of milch cows.

At the request of the editor of the *Hawaiian Forester* a few items are appended relative to the herd of thoroughbred Jerseys originally imported and bred by Hon. W. G. Irwin, and which the writer was fortunate in being able to purchase in February last from Byron O. Clark, Esq., of Wahiawa.

Of the origin of this herd I quote from the "Daily Bulletin" of February 24th, 1891:

"Mr. W. M. Giffard imported by the bark "Fifeshire" two thoroughbred Jersey cows and one bull for Hon. W. G. Irwin and a similar lot of animals for Mr. B. F. Dillingham. This stock was all specially selected by Mr. Giffard's brother on the Isle of Jersey. It is herd book stock with the registry certificates signed by the officers of the society accompanying each animal."

The reporter then proceeds to describe the animals, whose names are,—heifers, Fancy Bess, Princess of Bonne Nuit, Bijou 5th, Spartan Maid; bulls, South View Lad, and Una's King. He then concludes as follows:

"The stock is in remarkably good condition after the voyage of 147 days from Liverpool, in addition to the Channel passage. The animals are so sleek-coated, clean looking and kindly as to be well worth seeing, and for the gratification of the public will remain on view at Hon. W. G. Irwin's private stables, Queen street, until some time tomorrow.

"The buyers are fortunate in having the intermediary services of Mr. Giffard in direct and trustworthy communication with the home of this famous breed. All concerned may be considered public benefactors in introducing to the islands this unquestionably pure breed of Jerseys, the first ever imported into the Kingdom."

While the records of the herd since that date are unfortunately imperfect, it is interesting to note that there is now in the herd a cow bearing the name "Spartan Maid" and believed by Mr. Clark to be one of the original four heifers imported from the Channel Islands. Spartan Maid is still sleek and trim and though now old is still giving daily some ten quarts of milk of extraordinary richness.

The herd was added to from time to time by importations from California and grew as well by natural increase. Young bulls from the herd have been secured by various breeders and have done much to improve the dairy stock in many parts of the

islands. Some have been sent to California where they fetched a very good price.

One of the more recent importations by Mr. Irwin is Ojibway of Yerba Buena, whose picture and pedigree heads this article. Ojibway was bred by the late Henry Pierce of San Francisco, a gentleman of ability and great wealth, who devoted his leisure hours for some twenty-five years to the building up of a fine herd of Jerseys. He imported some fine animals direct from Jersey at great expense. Others were purchased at large figures from the best stock obtainable elsewhere.

An examination of Ojibway's pedigree shows the name of Pedro, the champion bull at the World's Fair in Chicago, who had fourteen daughters with records; Eurotas, who produced 778 pounds of butter in less than a year; Jersey Belle of Scituate with a record of 25 pounds 7 ounces butter in seven days; Belle of Scituate for which Mr. Pierce paid \$2,500; Carrie of Y. B. who produced 18 pounds butter in seven days; Piedmonts almost 20 pounds butter in seven days, and many other notable animals.

Ojibway of Yerba Buena is well described by the words of Peter J. Shields in the "Breeder and Sportsman," when describing Ojibway's sire, Earl of Yerba Buena:

"But being perfectly mindful of the lordly El Toro, with all his show yard honors, we are inclined to regard Earl of Yerba Buena as the greatest ever there or anywhere else. We have never seen a bull of so much perfection of form and carriage. His neck is neat and arched, his muzzle fine, his throat clean, body deep and long with depth carried well back, his tail is long and thin and admirably set on, his legs short, his color a fine grey, while his horns are fine and daintily incurved, and his hide rich and mellow. In breeding he has few equals; his sire being the great Pedro's Dirigo of Herba Buena, and his dam the phenomenal Piedmontes noted above. He is inbred and closely related to Alpha 6 gallons of milk and 4 pounds of butter per day; Eurotas 778 pounds of butter in less than a year; and Jersey Belle of Scituate 25 pounds 4 ounces of butter in seven days. These are three of the greatest cows that ever lived. In addition to this he is a grandson of imported Princess 15 pounds 10 ounces, and a great grandson of Euphrates 16 pounds 4 ounces in seven days. Had his owner, Mr. Pierce, been more of a salesman and less of a breeder he would have shown Earl at the recent World's Fair at

Chicago, where he would unquestionably have won honors and distinction. He is much of the form of his great progenitor Pedro, who was the World's Fair champion, but with an added style and quality which he gets from his great mother.

DEFORESTATION AND CLIMATE.

Dr. Hennig recently gave an address on the influence of forests upon climate before the May meeting in Berlin of the German Meteorological Society, in which he adduced a number of coincidents where the depletion of the forests appears to have been attended by drier conditions. According to Consul-General Gunther of Frankfort, who has summarized the address for the Consular Reports, Dr. Hennig said that the climate of Greece, where to-day only 16 per cent. of the area is covered with forests, has become drier. An increase of temperature and decrease of rain are noted, as compared with ancient times. This is especially noteworthy in Attica, which was thickly covered with forests about 3000 years ago, and where hardly any rain now falls; while the heat in the open air attains a degree of intensity that would make the indulgence in athletic sports, once famous, now almost an impossibility.

Similar conditions exist in the peninsula of Sinai, where thousands of years ago the people of Israel found a luxuriant and fertile country, though to-day it is a desert. Palmyra, also once a flourishing oasis in the Syrian desert, presents to-day only a waste of stones and ruins. In Mexico, where the Spaniards cut down the forests in the mountains, droughts changing to devastating floods are now noticeable, especially in the neighborhood of the City of Mexico. In Algeria, where, since the middle of the last century, the forests have been cut down on a large scale, dry weather has increased; and in Venezuela the level of Lake Tacarigua, to which Alexander von Humboldt drew attention, has been lowered in consequence, it is said, of deforestation.

ENTOMOLOGICAL NOTES.

From the Division of Entomology, Board of Agriculture and Forestry.

By JACOB KOTINSKY.

THE MANGO WEEVIL (*Cryptorhynchus Mangiferae*, FABR.)

In his notes of warning against this insect both in the daily press and in the last number of the Forester, Mr. Van Dine seems to lay considerable undue stress on its "recent introduction." To the general reader the word recent conveys the idea of a few weeks or months. Such an impression would be erroneous and should be dispelled. The fact is that in view of the rigid entomological inspection instituted by this Board in August, 1904, it is practically impossible that the weevil should have been introduced since then. Moreover, in order to have become so numerous and extensively distributed as this insect is at present it must have been either introduced in thousands in the first place which is scarcely probable or, since its life cycle is an extended one, it must have been upon these islands several years. Mr. Perkins, the best informed man on the Hawaiian fauna, with whom the subject was recently discussed says, "It would be pretty safe to put the time of introduction as at least three years previous to its first being noticed in numbers, as a beetle of this sort, which can only breed when mangoes are in fruit, cannot breed very quickly."

ASIATIC LADY-BIRD (*Chilocorus Similis*, ROSSI.)

Dr. Nicholas Russel of Oloa, Hawaii, has long been one of the most intelligent and valued correspondents of the Board's Entomological Division. Recently he went to Japan. At the request of Mr. Craw who supplied him with letters of introduction to entomologists in Japan, he undertook to introduce into the Territory what beneficial insects he may come across. On the 8th of September this office received from Dr. Russel a colony of Asiatic lady-birds. In the absence of suitable tubes the Doctor made ingenious use of ordinary lamp chimneys. These he filled with food for the lady-birds and with it placed as many pupae and adults of the lady-birds as he could find. In their turn the chimneys were packed in damp moss in a box and placed in cold storage on the "Mongolia." Of the lot sent, three beetles and five pupae came through in excellent condition. A few days later

the pupae reached maturity and subsequently the office was in the happy possession of five strong beetles. To the writer the care of these beetles was a lively treat for, he has had two years' experience with them at the U. S. Bureau of Entomology at Washington, whither it was introduced to check the ravages of the notorious San Jose scale and where he has had such signal success in rearing it.

The preferred hosts of this lady-bird in Japan and China are what is known in the states as the "peach scale" (*Diaspis pentagona*, Targ.) with the San Jose scale (*Aspidiotus perniciosus*, Coms.) as a close second. While both of these scale insects are reported from the Territory, their abiding place was not definitely known. The entomologist in charge was, therefore, obliged to resort to experiment in order to determine whether the lady-bird would adapt itself to some other scale insect that occurs in abundant numbers in the vicinity of the laboratory. Naturally, only closely allied species of scale insects could be depended upon to supply the pressing want—food for the hungry. This was fortunately found in the rose scale (*Aulacaspis rosae*, Sandb.) which the beetles readily accepted as food and breeding environment. Ere very long eggs laid by the beetles were observed and a considerable number of these were subsequently brought to full maturity, and at this writing the second generation is getting a start in Hawaii nei. A couple of weeks ago, Mr. Austin reported the presence of the San Jose scale on some peach and plum trees at Mokuleia, Oahu, and infested twigs of these were used as food in the breeding jars with good success. See a following rubric about the San Jose scale colony. The beetle has the peculiar and interesting habit of withdrawing the scale insect from beneath its scaly dome and while munching it, fill the tenancy with an egg of its own. A full report of the habits of this lady-bird appears in the 1902 Year Book of the U. S. Department of Agriculture written and illustrated by C. L. Marlatt, the entomologist who introduced it into the states.

But let us not be misled in our hopes. While the beetle thrives on the rose scale in the laboratory, there is no telling what will be its fate when it is placed out of doors. Mr. Koebele has undoubtedly introduced the beetle into these Islands in the past, but no records are at hand to say whether they arrived in good condition and whether they were properly cared for upon arrival, nor

have any specimens of the lady-birds been collected thus far. When the colony is sufficiently strong no effort will be spared to establish the insect in the Territory.* Even if it does not prove a signal success it will doubtless prove useful in helping to check some scale insects, especially upon plants in yards not otherwise looked after.

THE TOWOOMBA LADY-BIRD (*Rhizobius Towoomb*, BLACKB.)

While examining rose scales in search of eggs of the Asiatic lady-bird, numerous larvae of another species were frequently observed feeding upon this scale insect. Upon a bit of rose twig not four inches long and not a quarter of an inch in diameter eleven of these larvae were counted one day and subsequently a good many more were reared from the same stick. When brought to maturity the beetle proved to be the above named lady-bird. This insect is dark brown in color, minutely hairy, with a yellowish brown head. Its eyes are quite prominent; the legs and underbody are lighter brown and the entire insect is about one sixteenth of an inch long.

The same lady-bird was found feeding upon another white scale (*Hemichionaspis rhododendri*, Green) upon the small poinciana, "Pride of Barbadoes," (*Poinciana pulcherrima*) bordering King Street in the "Old Plantation," and upon a roadside weed, (*Waltheria americana*.)

THE SAN JOSE SCALE (*Aspidiotus Perniciosus*, COMST.)

Some two weeks ago, Mr. Austin of this office, brought from Mokuleia, Oahu, several twigs of peach and plum badly infested with the San Jose Scale. While the insect has been reported upon fruits and plants received here from the states, the fact that it has gained a foothold upon these islands is not to be found on record, and the present territorial entomologists were not aware of the location of the colony until the present time. The trees in question came from Florida.

This scale insect was recognized as a dangerous pest some thirty years ago when first discovered in San Jose, California, from which it acquired its common name. It was then supposed

Since writing these notes a strong colony of lady-birds has been placed at Mokuleia upon the San Jose scale there.

that California was its native home, but a United States Department of Agriculture entomologist has definitely ascertained in 1901, north China to be the original home of the insect. The specific name of it, perniciosus, which corresponds to the Christian name among humans, is an indication of its nature. Upon nursery stock it was subsequently introduced into a nursery in New Jersey and thence distributed all over the Eastern States and now is to be found in practically all the states. Unchecked as it was by natural enemies it played havoc with every plant it infested and it was easier to enumerate the plants free from it than those subject to its attack. At one time it actually menaced fruit culture in the states, and but for the timely discovery of the effectiveness of the lime, salt and sulphur wash against the pest it would have gone hand in hand with fruit growers.

Under these conditions we were eager to determine the status of the colony at Mokuleia. Guided by Mr. Austin, Mr. Craw visited the orchard a few days after the discovery and gave it a thorough inspection. He found the insect unquestionably on the decline. On the older branches the scale was entirely dead, and on the younger ones not enough live material was found to affect their growth. This, he attributes to the work of a Chalcid (*Aphelinus fuscipennis*, How.), a minute lemon yellow, four transparent winged, fly which was observed on the trees, and also bred in our laboratory from the scale. This is the identical parasite that Mr. Craw knows to have checked the San Jose scale in Southern California to an extent that spraying was abandoned. Under such conditions the presence of the San Jose scale in this Territory need not be dreaded. It is agreeable to realize that with few exceptions scarcely a scale insect can hold its own in this Territory in view of the presence of the numerous and varied parasitic and predaceous insects that have been introduced by Mr. Koebele in course of his connection with the islands. The saving from insect injury that has accrued to the Territory in consequence of Mr. Koebele's work, while it is impossible to be estimated in figures, has repaid expenses many times over.

FOREST RESERVE PROCLAMATIONS.

In the August number of the Forester and Agriculturist there appeared an account of the proposed forest reserves on the Islands of Kauai and Maui, with the reports of the Superintendent of Forestry in regard to them. On August 23rd the Public Hearing required by Law was held by Acting Governor Atkinson and the Board of Commissioners of Agriculture and Forestry to enable those so desiring to present arguments in favor or against the creation of these reserves. No opposition developing Acting Governor Atkinson on August 24th signed the proclamations creating the two reserves. These are given in full below.

PROCLAMATION OF FOREST RESERVE IN THE HALELEA DISTRICT, ISLAND OF KAUAI.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands comprising the mauka part of the Halelea District, lying above a line drawn approximately parallel to the Coast, following the foot of the steep slope of the main ridges, above the belt of agricultural and grazing land in the District of Halelea, Island of Kauai, Territory of Hawaii, more particularly described as follows, viz:

Beginning at a X on a stone and ahu on the highest part of Kapaka Hill on the Boundary of Hanalei and Kalihiwai, from which Government Survey Trig. Station "Pooku" is by true azimuth and distance $169^{\circ} 51'$ 14.993.4 feet, and running by true azimuths:

1. $231^{\circ} 00'$ 7887.9 feet, across Kalihikai and Kalihiwai to an iron pipe at the top of pali at East side of Kalihiwai River at Ooluaili; thence following edge of Pali in the land of Kalihiwai direct azimuth and distance being;

2. $197^{\circ} 42'$ 2346.3 feet to X on rock at Waihunahuna;

3. $218^{\circ} 14' 30''$ 1285.4 feet to X on rock at Kumumau;

4. $241^{\circ} 26'$ 1602.3 feet to a granite post set flush with the ground at Waihaa;

5. $265^{\circ} 14'$ 3599.1 feet to an iron pipe at makai end of Kamookoa ridge;

6. $282^{\circ} 27' 30''$ 495.0 feet more or less to the Boundary of Halelea and Koolau Districts;

7. $4^{\circ} 25'$ 14,700.0 feet along boundary of Koolau District to a peak called Namahana;

8. $78^{\circ} 50'$ 690.0 feet along boundary of Koolau District following the ridge to a high peak called Kokoiki (elevation 2500 feet); also called lalamalamaiki in survey of a portion of Kalihiwai made by M. D. Monarrat, of record in Liber 107, folio 456 of Hawaiian Registry of Conveyances; which peak is the Northwest corner of Anahola;

9. Thence along the boundary of Koolau District down a spur to an elevation of 1820 feet and up a spur to a point called Last Peak, the elevation of which is 2350 feet and the direct azimuth and distance being $26^{\circ} 42'$ 6526.1 feet;

10. Thence along the boundary of Koolau District following the ridge to Pueo, the Northwest corner of Kealia, the elevation of Pueo being about 2410 feet and the direct azimuth and distance being $321^{\circ} 20'$ 1537.0 feet;

11. Thence along the boundary of Puna District following the ridge to Tip Top, the elevation of which is about 2710 feet and the direct azimuth and distance being $357^{\circ} 21'$ 1419.0 feet;

12. Thence along the boundary of Puna District, following the top of Pali and the ridge which divides the water sheds, to Makaleha, the Northwest corner of Kapaa, the elevation of which is 2800 feet, and the direct azimuth and distance being $43^{\circ} 57'$ 1969.0 feet.

13. Thence along the boundary of Puna District, following the divide between water sheds and down a spur to an elevation of 1880 feet, and to Keahua, the elevation of which is 1905 feet, the direct azimuth and distance from Makaleha being $69^{\circ} 49'$ 6682.0 feet;

14. Thence along the boundary of Puna District following the ridge down to an elevation of 1820 feet and up to Government Survey Trigon Station "Hanalei" marked by a stone set in the ground the Southeast corner of Hanalei, the elevation of which is 1940 feet, the direct azimuth and distance being $89^{\circ} 23'$ 1064.0 feet;

15. Thence in a Southwesterly direction along the boundary of Puna District to Waialeale, the elevation of which is about 5240 feet;

16. Thence along the boundary of Kona District in a Northwesterly direction to a point at the junction of the boundaries of the Districts of Kona, Na Pali and Halelea;

17. Thence along the boundary of the Na Pali District in a Northwesterly direction to a point 2000 feet, more or less, makai of a prominent ridge running down into Wainiha Valley;

18. $272^{\circ} 56'$ 7800.0 feet more or less, across land of Wainiha to a peak called Kealawela;

19. $291^{\circ} 30'$ 6751.2 feet across the land of Lumahai to Pua Koanui;

20. $277^{\circ} 24'$ 5331.8 feet across the land of Waipa to the boundary of Waipa and Waioli;

21. $271^{\circ} 38'$ 11,905.2 feet across the land of Waioli and Hanalei to ihimanu;

22. $319^{\circ} 20'$ 3897.8 feet down ridge crossing the Waikani stream and up the ridge to Waipuhi in land of Hanalei;

23. $358^{\circ} 07'$ 1741.2 feet crossing a gulch and up to Puu o Miki;

24. $338^{\circ} 35'$ 1064.6 feet across the Hanalei River to south bank to on a stone and ahu at Kukuipopopo in land of Hanalei;

25. $290^{\circ} 20'$ 4587.8 feet to the initial point.

Approximate area 40,500 acres.

Included in the above description but excluded from the reserve is the area of agricultural land situated and described as follows:

Beginning at Kapaka, the initial point of the Forest Reserve survey and running along Kalihiwai, and water shed of ridge, the direct azimuth and distance being:

1. $000^{\circ} 30'$ 5332.9 feet,
2. $323^{\circ} 38'$ 3828.0 feet,
3. $302^{\circ} 34'$ 3551.0 feet,
4. $339^{\circ} 39'$ 6556.0 feet,
5. $351^{\circ} 52'$ 1268.1 feet along edge of Kalihiwai Valley at elevation of 1820 feet.

Thence following the 1800 foot contour to the Eastern edge of Hanalei Valley and following the Eastern edge of same in a Northerly direction to the initial point.

Approximate area 3,000 acres.

AND I do hereby set apart as a Forest Reserve those portions of the Government lands known as the Ahupuaas of Hanalei and Waioli, lying within the said metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal.)

Done at the Executive Building, in Honolulu, this 24th day of August, A. D. 1905.

A. L. C. ATKINSON.

PROCLAMATION OF FOREST RESERVE IN THE KOO-LAU AND HAMAKUALOA DISTRICTS, ISLAND OF MAUI.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands lying between the Hana-Koolau District boundary line, at the East end, and the land of Opana in Hamakualoa, at the West, and between the line of the Koolau and Upper Hamakua Ditch and the crest of the ridge on the North side of the crater of Mount Haleakala, in the Districts of Koolau and Hamakualoa, Island of Maui, Territory of Hawaii, more particularly described as follows, viz:

Beginning at a point on the boundary line between the District of Hana and Koolau, where the mauka boundary of the Nahiku homesteads if projected easterly would intersect the said District line, the boundary runs:

1. In a general northwesterly direction to and along the mauka boundary of the Nahiku Government homesteads to the gulch between

the land of Kapaula and Puakea, or Paakea, said gulch being also named Waiaaka gulch on Public Lands map No. 20 of Nahiku, about 22,000 feet in direct line;

2. Thence, makai, down said Waiaaka gulch to the Koolau Ditch, about 2800 feet in a direct line;

3. Thence in a general westerly direction along the Koolau and Upper Hamakua Ditch trail to the western boundary of the land of Opana in the District of Hamakualoa, about 61,000 feet in a direct line;

4. Thence mauka along the westerly boundary of said Opana to the makai boundary of the land of Haiku uka, belonging to the Haiku Sugar Co. and Paia Plantation, about 20,000 feet in a direct line;

5. Thence, in a general westerly direction, along the makai boundary of the said Haiku uka land of the Haiku Sugar Co. and Paia Plantation, to the Maliko Gulch, near Pali o Ka Moa, about 2000 feet in a direct line;

6. Thence south 34° East, true, 17,800 feet, along the land of Makawao to the summit of the hill called Puu o Kakae;

7. Thence south 53° 21' East, true, 42,980 feet, along the land of Kaliainui, crossing the Koolau Gap, to Pohaku Oki Aina;

8. Thence in a general easterly direction, along the northern crest of the Kipahulu Valley to a point where the boundary line between the Districts of Koolau and Hana intersects the Kipahulu Valley, about 10,000 feet in a direct line;

9. Thence in a general northeasterly direction, along the said boundary line between the said Districts of Koolau and Hana to the point of beginning, about 21,500 feet in a direct line.

The various distances given in the above description are approximate only being scaled from the map showing the Reserve boundary.

Area 42,969 acres, more or less.

And I do hereby set apart as a Forest Reserve those portions of the Government lands known as the Nahiku Forest Tract and the West Koolau Forest Tract, (described respectively and more particularly in Public Lands Office Leases No. 520 B. (Koolau Water Rights) and Nos. 267 B. and 475 (Hamakualoa Water Rights), granting the water rights thereon), within the said metes and bounds.

In WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal.)

Done at the Executive Building, in Honolulu, this 24th day of August, A. D. 1905.

A. L. C. ATKINSON.

CORRECTION.

In the report of the Superintendent of Forestry on the proposed forest reserve on the Island of Maui, published last month, a correction should be made in the list of lands comprising the reserve, (page 239). The Nahiku Forest Tract is leased to the Nahiku Sugar Co., not to the Hana Plantation Co., as stated. Public Lands Office Lease 520 B.

FOREST SERVICE.

The New Name of the Bureau of Forestry.

From July 1, the Bureau of Forestry is to be officially known as the Forest Service. The change was made by Congress last winter, when it provided for the Government work in forestry during the coming year, and signalized an important advance in the scope of that work. The actual control and administration of the national forest reserves, formerly under the charge of the Land Office of the Department of the Interior, is now in the hands of the Forest Service, the only branch of the public service possessed of the scientific and technical knowledge necessary for the enlightened care and use of the forests. This means that the reserves are to be made to yield to the people of the country the largest benefits which intelligent management can get out of them. Use, not reservation from use, is the essential purpose for which they exist—but use under such conditions as shall make their benefits permanent.

Control of the reserves was turned over to the Bureau of Forestry last February, and the necessary reorganization is now well advanced. In taking up its new work, however, the Forest Service will not abandon any part of the old field of the Bureau. Its broad purpose will continue to be the furtherance by every possible means of the movement to introduce practical forestry everywhere. It will do its utmost to assist this movement among private owners and in the several States, not only by scientific investigations but by advice and co-operation in the actual work of applying forestry. This is imperatively demanded if the general welfare is not to suffer profoundly in the future from a shortage of timber supply. The Forest Service will continue the studies of forest products, of methods of making timber more durable, of tree planting, and of all subjects which can promote wiser and more profitable use of our second greatest resource—for in the value of their total contribution to our needs there can be no doubt that forest products stand next to those of agriculture.

The field of the Bureau of Forestry has expanded remarkably in the past few years. The first Government recognition of forestry was in 1876, when Congress made an appropriation for a skilled man to prosecute a study of forest conditions, needs, and

uses, and make a report to Congress. This office was continued until the Division of Forestry was created, July 1, 1886. Then from a mere office of information the Division stepped suddenly into the field of actual operations, demonstrating by example how forestry could be made to pay, and thus furnishing the one argument needed to convert private owners from scepticism as to the practicableness of a theory to the acceptance of a proved fact. When this was accomplished a new epoch in the history of American forestry opened. Since that time no single step forward has been so important as that which the use of the new name, Forest Service, now marks. This the people of the country, and particularly the people of the West, where the reserves are, will come to realize as they grasp the fact that, scientifically and efficiently administered, the reserves will soon reach their highest efficiency as contributors to the wealth and permanent development of the regions in which they lie.

Washington, D. C., July 8, 1905.

NEW PUBLICATIONS.

Hawaii Agricultural Experiment Station. Bulletin No. 10. Insect Enemies of Tobacco in Hawaii by D. L. Van Dine, Entomologist, Washington, 1905. With the above publication, the author makes a valuable addition to the series of entomological papers he has already written. Through the courtesy of Mr. Van Dine, much of the material in this bulletin has already appeared serially in the *Forester* during the past year, but the increased interest in the growing to tobacco in Hawaii has made it advisable to publish this information in revised form, for general distribution throughout the Territory.

Hawaiian Sugar Planters' Association. Report of Work of the Experiment Station. *Division of Entomology*, Bulletin No. 1, by R. Perkins, Leaf Hoppers and Their Natural Enemies, Parts 3 and 4. *Division of Agriculture and Chemistry*, Bulletin No. 15. Fertilizer Experiments 1897-1905, by C. F. Eckart. 57 pages. The series of experiments considered in the above bulletin were planned and started by Dr. Walter Maxwell in 1897 and deal with four successive crops of Lahaina and Rose Bamboo cane grown on small field plats (1,000 sq. ft. area) to which fertilizing

materials were applied. The average yields of cane and sugar and the quality of the juices furnish data of considerable value, as the action of the different fertilizers is shown for the varying condition obtaining during an eight years' test.

United States Fish Commission. Bulletin Volume XXIII. Qto. II Pts. The Aquatic Resources of the Hawaiian Islands, by David Starr Jordan and Barton Warren Evermann. Part I. The Shore Fishes of the Hawaiian Islands with a General Account of the Fish Fauna. Part II. Section II. The Deep-Sea Fishes, by Charles Henry Gilbert. Section III. The Commercial Fisheries by John N. Cobb. 765 pages, 286 text figures, 106 Black and White Plates, 73 colored plates and map. Washington, 1905.

Experiments in the Culture of Sugar Cane and its Manufacture into Table Sirup, a report on the investigations conducted at Waycross and Cairo, Ga., in 1903 and 1904 by H. W. Wiley. U. S. Department of Agriculture, Bureau of Chemistry. Bulletin No. 93. Washington, 1905, 78 pages. Illustrated.

The Maple Sugar Industry, by William F. Fox and William F. Hubbard, with a discussion of the Adulteration of Maple Products by H. W. Wiley. U. S. Department of Agriculture, Bureau of Forestry. Bulletin No. 59. Washington, 1905. 56 pages. Illustrated.

Forest Preservation and National Prosperity. Portions of Addresses delivered at the American Forest Congress, Washington, January 2 to 6, 1905, by President Roosevelt, Ambassador Jusserand, Secretary Wilson, and others. U. S. Department of Agriculture, Forest Service. Circular No. 35, 31 pages.

Terms used in Forestry and Logging prepared in co-operation with the Society of American Foresters. Containing the English forest terminology used in the United States and the more important German and French equivalents. U. S. Department of Agriculture, Bureau of Forestry. Bulletin No. 61. Washington, 1905. 53 pages.

Cultivation of Oranges in Dominica. Issued by the Commissioner of Agriculture, Imperial Department of Agriculture for the West Indies, 1905. Pamphlet Series No. 37. 52 pages.

THE GOVERNMENT FOREST EXHIBIT.

At the Lewis and Clark Centennial Exposition, Portland, Oregon.

The exhibit of the Forest Service at the Lewis and Clark Exposition gives deserved prominence to the need and the value of forestry in the Northwest. It emphasizes the great benefits of the forests to the region, both on the northern Pacific coast, where they are the richest in the world in their stand of merchantable timber, and in the agricultural areas of eastern Washington and Oregon, where they dominate the success of irrigation by their storing and supply of treasured water. Indeed, the intimate relation between forestry and irrigation—the most important economic problem of the Northwest—is most fully brought out in the association of the forest exhibit with that of the Reclamation Service in the same building.

The picturesque Oregon State "Forestry Building," constructed of the giant red fir logs, is distinct from the Government forestry building, but it has attracted much attention and has also assisted greatly in impressing the public with the exceptional character of the northwestern forest reserves.

The Government forest exhibit consists of very large transparencies and bromide photographs, models, charts, instruments, tools, machines, apparatus, and wood material, the whole forming a history of the forest movement in this country. The illustrations, which are designed to show the necessity of forestry, as well as its methods and its accomplishments, present the actual forest conditions in every important region of the United States and the various ways of improving them. Good and bad forest conditions are contrasted; the success which has followed conservative forest work is thrown out in relief against the failure which follows careless, ignorant, or heedless effort; wasteful and conservative lumbering, forests ravaged by fire, and forests protected from fire, are displayed side by side; stripped and eroded mountain slopes are placed next well-protected ones, properly grazed areas next those overgrazed. So through all the lines of work which the Forest Service is conducting, the right and the wrong ways of working are forcibly impressed upon the visitor.

The exhibit does not end, however, with disclosing the damage to forests in the past, or even with prescribing preventives for the

future, but it also shows how the naturally treeless plains of the Middle West are capable, under correct methods of tree planting, of supporting forest growth, and how fire-swept and denuded mountain slopes of the East and West can be reclaimed to forest—something vitally important for conserving the stream flow for agriculture, manufacture, and commerce.

NEW PAPER MATERIAL.

Interest has been created in Matamoras, Mexico, by the suggestion that the fiber of the papaya, commonly known as the Mexican papaw, would probably afford an admirable material for the manufacture of high-grade paper.

The fiber in question is the full length of the tree trunk and appears to be quite strong and rather silky in texture. With the exception of the bark and a small pithy heart, the trunk is composed entirely of this fibrous material. Some samples of the fiber have been sent to an American paper expert and manufacturer with the purpose of having it tested with reference to its adaptability for the manufacture of the higher grades of paper.

The plant grows rapidly, attaining a diameter of from two to three inches when 1 year old. It requires no special care nor cultivation and grows luxuriantly on either the sandy or black waxy soil of this region.

Although known as the Mexican papaw, it is claimed that the papaya is not indigenous to Mexico, but was brought to this country originally from the Moluccas by the Spaniards, a fact well worth noting, for if it proves to be anything like as good a paper maker as its friends urge it might be tried in Florida and California.

To judge from its appearance, it seems probable that no decorticating machinery would be required in its treatment, as the fibrous material is devoid of woody elements to all appearances.—Consul Griffith, Matamoras, Mexico.

A CYCLOPEDIA OF AMERICAN AGRICULTURE.

Information has lately been received of a publication which should be of value to many Agriculturists in Hawaii, in process of compilation by The Macmillan Co., under the Editorship of Mr. L. H. Bailey. The work is intended to form a Cyclopedia of American Agriculture and will contain signed articles by the leading experts in North America, among both investigators and practical farmers. It is intended to publish the work in four volumes, as follows:

Vol. I. Farms, Climate, and Soil.

Vol. II. Crops.

Vol. III. Animals.

Vol. IV. The Farm and the Community (Economics, Statistics, Social Questions, Organizations, Education, History, Literature, etc.)

Letters have been issued by Mr. A. R. Mann, the Secretary of the work, of Ithaca, N. Y., inviting the co-operation of practical men in all parts of the country. It is hoped that readers of the Forester possessing available information will communicate with Mr. Mann so that the Hawaiian Islands may obtain their proper representation in the agriculture of the United States. Articles are especially desired and also photographs (prints) of all farm operations, machinery, water works, buildings, good stock, crops, individual plants, weeds, fences, roads, and all agricultural subjects of interest. The prints need not be specially good, as line drawings are to be made from them.

IMPORTANT ARTICLES IN CONTEMPORARY AGRICULTURAL PUBLICATIONS.

The Agricultural Gazette of New South Wales.

July.—Farmers' Fowls, Wyandottes. Ducks and Duck Farming.

August.—Dairying in New South Wales. Cheddar Cheese Making, Canadian System. Farmers' Fowls, Wyandottes, continued.

The Journal of the Dept. of Agriculture of South Australia.

July.—Advice to Beginners in Beekeeping. The Duck, Illustrated.

August.—Breeding Table Poultry.

The Journal of Agriculture of Victoria.

July.—Australian Horses, Illustrated. I. The Australian Draught Horse. Fruit Eating Birds, Native and Introduced. Ducks for Profit, Illustrated. Starters in Cheddar Cheesemaking.

August.—The Australian Horse, Illustrated. II. Light Breeds. The Essential Elements of Orchard Making and Management.

The Journal of the Dept. of Agriculture of Western Australia.

June.—Date Palms from Algerian Sahara, Illustrated.

The Tropical Agriculturist, Colombo, Ceylon.

June.—The Cultivation of the Cocoanut Palm. Caterpillar Pest of the Rice Fields.

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ARBOR DAY.

Hawaii has this year added another day to the list of semi-holidays that are observed in the schools of the Territory. By proclamation of the Governor, Friday, November 3rd has been set apart as Arbor Day, with the recommendation that on that day "appropriate and instructive exercises be held in all our public schools and that a part of the day be devoted to the planting of trees and shrubs upon the school grounds."

It has not needed an Arbor Day to awaken the spirit of tree planting in Hawaii. That has been vigorously alive here for many years, but much remains to be done, especially in the way of improving and making beautiful the school and other public grounds throughout the Territory, and in roadside planting. The official observance of Arbor Day should do much to bring about these desirable ends.

To give the first Arbor Day to be officially observed in the Territory a good send-off, Governor Carter generously offered to contribute half of a fund from which a prize to the value of five dollars should be awarded in each of the 154 public schools in the Territory for the tree planted on Arbor Day that as the result of being well cared for was in the most thrifty condition at the end of the year. The other half of the fund has been contributed by firms and individuals in Honolulu, the total amount raised being \$770.00.

On another page of this issue, as parts of Press Bulletin No. 2 of the Division of Forestry, may be found the report of the Arbor Day Prize Fund Committee and a list of those contributing to the fund.

The Arbor Day Proclamation issued by Governor Carter is as follows:

TERRITORY OF HAWAII,
EXECUTIVE DEPARTMENT.

ARBOR DAY PROCLAMATION.

In accordance with the custom adopted by other States and Territories setting apart a day for the promotion of forest growth I do hereby designate Friday, November 3, 1905, as ARBOR DAY for the Territory of Hawaii.

I recommend that appropriate and instructive exercises be held in all our public schools and that a part of the day be devoted to the planting of trees and shrubs upon the school grounds.

Given under my hand and the great seal of the Territory of Hawaii, at the Capitol Building, in Honolulu, this 11th day of October, A. D. 1905.

G. R. CARTER.

By the Governor:

A. L. C. ATKINSON,
Secretary of Hawaii.

THE MANGOSTEEN.

Since the publication of Mr. Garrett Wilder's article on the Mangosteen, we have learnt that Dr. Thompson whilst on his travels around the world about a year and a half ago, was presented by the Curator of the Botanical Gardens in the Straits Settlements with a dozen seeds of the Mangosteen, packed in charcoal dust in an hermetically sealed case. Upon his return to Honolulu, Mr. Thompson presented the case to Mr. Giffard, who on opening it found the seeds commencing to germinate. From these, nine plants were secured, one of which has since died. The remainder though requiring a moister climate than obtainable in Honolulu are doing well. Three and one-half years ago, Mr. Giffard imported three Mangosteen trees from Florida, which were planted on Mr. Irwin's Ranch at Maunawili. One of these is thriving and as the climate of the neighboring valleys seems favorable for the growth of this tree, it is probable that most of those secured from Dr. Thompson's seed will eventually be planted there.

II. THE AGRICULTURAL TRAINING OFFERED AT THE KAMEHAMEHA SCHOOLS.*

Agriculture is the noblest, most healthful, most useful employment of man.—Washington.

INTRODUCTION.

As set forth in the Annual Register of the Kamehameha Schools, "the Agricultural Department aims to give a systematic two years' course in the sciences relating to agriculture and a practical training in general agricultural practice adapted to Hawaiian conditions, with a view to qualify its students for the intelligent and profitable management of their own farms, or as overseers of plantations for others."

The ultimate object of the agricultural department of the Kamehameha Schools is to make good farmers of those of our Hawaiian youths who may be awakened to the opportunities offered to the successful farmer of today, and in his own land, where its possibilities, for the moment, have been overlooked, or are not yet realized.

It is believed to be one of the worthy purposes of these schools to disseminate more widely among our youth, a knowledge and training in the theory and practice of an improved agriculture, thus, early in life instilling a clearer understanding of the importance of and a higher appreciation of the advantages of scientific farming and country life.

In this largely lies our hope of turning the tide of Hawaii's rising generation country-ward,—there to establish contented rural communities with a citizenship of an improved and higher type than any hitherto known in this Island Paradise.

In framing the agricultural course for Kamehameha, where the various trade departments and academic studies all have an equal rating, it will of course be understood that we do not expect all our students to become farmers, any more than that we expect all to become machinists, bookkeepers, or teachers. As a matter of fact, we expect a less number to specialize in agriculture and make this their life-work, than in any of the other departments, at least for some time to come, but we aim

Second paper in "A Plea for Agricultural Education in Hawaii."—Continued from "The Hawaiian Forester and Agriculturist" for July.

to make all students acquainted with at least the fundamental principals of agricultural science and art, believing that such study and practice, rightly conducted, must cultivate an interest in and instill a love and respect for the land and the occupation of agriculture. Nor do we believe that any other field of study and its application offers better or more varied opportunity for the development of natural gifts and for character-building,—for healthful exercise, for independent thought and action, in a word: for a large, full, wholesome life, than does a well equipped agricultural training.

We believe that no other calling is so widely and closely kindred to all other pursuits as is agriculture in its manifold phases, and therefore, no matter what one's eventual occupation or station in life, an agricultural education will lend its aid. In this day and place, no education is broad and liberal that does not include agriculture, and every Kamehameha student is either directly or indirectly benefited thereby.

While the specifically agricultural course at the Kamehameha Schools covers the last two years of the six years' manual training course for boys, all students upon entering the first year, and continuing through the fourth year, take up a prescribed course of nature study with a distinctive agricultural trend, although its obligations to the work of the shops is not neglected. Field work on the school farm is also required of all students, one and a half hours each morning being devoted to such work for at least a half term during each school year. During the first year, the insect life of the extensive school campus is studied; collections are made of eggs, larvæ and young, and their habitat, behavior and development are noted both in field and laboratory; special stress being laid on those of economic importance. Students are encouraged to make personal collections and are given additional credit for original observations. During the second year the elementary study of plant life is taken up, native and introduced plants of economic value are studied, principally from the simpler morphological and physiological standpoints; the banana, cocoanut, papaia (*Carica papaya*), taro (*Colocasia antiquorum*), the great Hawaiian staff of life, and like plants being used as subject matter. The study of insect pests is continued and en-

larged upon. The third year's work in nature study is almost wholly taken up with the study of physical forces and their utilization by mechanical devices, which is of much value to the agricultural student as well as to the mechanical students.

During the third year, students wage war upon mosquitoes, of which we have abundant material to work upon, visiting every part of the campus in search of breeding places, using oil to destroy the larvæ when it is impracticable to drain the stagnant pools. Having previously studied the mosquito quite exhaustively, such field excursions are entered into with enthusiasm and intelligence.

During the fourth year, an experimental introduction to agricultural chemistry, of an elementary character, assuming no knowledge of chemistry on the part of the student is undertaken. Study of and simple experiments with the elements which enter into the composition of plants and animals; their properties, affinities and combinations are carefully gone over. Physical and chemical changes are noted. The relationship of plants and water, air, soil and temperature are considered, as well as the nature of each.

Thus prepared, the student enters the agricultural course with an open mind, often intensely eager to explore further into the realms of agricultural science. In the meantime he has had sufficient actual field practice to learn the simpler *how's* of general farm operations and begins to realize that there is a *why* for all he does. We have hope for the student when he reaches this stage; and personal walks, talks and demonstrations are in order.

EQUIPMENT AND WORK.

“Theory without practice is blind.”

“To learn to do by doing,” adequate equipment is essential for best results along modern agricultural lines as well as those of a mechanical nature, and this has been generously provided. The lands of the schools comprise more than one thousand acres, the greater portion of which, however, is hill pasture and forest, but is all easily accessible to the schools, and opportunity will in time permit much of this extensive area to be

developed into improved forest and pastures, as well as to provide additional cultivated lands as they become necessary for the maintenance of increasing needs. Thus far some twelve acres immediately surrounding the schools has been cleared of timber and rock by the students, and is under a high state of cultivation.

The campus comprises about seventy-five acres in addition and offers exceptional opportunity for extensive landscape gardening operations. The greater portion is already laid out to lawns. The lowest lands are at about seventy-five feet elevation and the whole area is sufficiently inclined to give good drainage. The site is noted for its healthfulness and fine view. A comprehensive view of the city of Honolulu two miles distant, of the harbor with its extensive shipping, and of the grand Pacific beyond,—the bold prominence of the famed craters, Punchbowl and Diamond Head, in the middle distance, and a background of lofty, rugged mountains perpetually green, forms a panorama of grandeur and beauty that is an inspiration to students and teachers alike.

While much remains to be desired from a purely agricultural standpoint, the lands are ample in scope and diversity to offer almost unlimited opportunities in all branches of agriculture, and the overcoming of difficulties in the matter of bringing our stiff, heavy and rocky lands under cultivation, is in itself a valuable practical lesson to our students, since it is just such conditions under which many of them will need to make a beginning for themselves.

The importance of a dairy-herd to supply the three hundred odd students with wholesome milk, was early recognized, and from a few poor native cows the herd has increased to twenty select animals, among them being several noted cows, the full blood Jersey, Pua Ilima, having a 365 day record of 8884 pounds milk of 5.1 per cent. richness. The recent importation of five fine registered Holstein-Freisian cows and the Junior Champion Bull Colanthus Onyx Lad, places the Kamehameha Schools' Dairy-herd in the front rank of Hawaii's Dairying development. In addition to choice representatives of the Jersey and Holstein breeds of dairy cattle, the dual-purpose breed of Red Polled cows, and various grades have a place for demonstrative purposes. It is hoped, in time, to add represen-

tation of the strictly beef breeds, as much of the hill-pastures are adopted to the raising of beef animals, as well as for sheep and goats, neither of which are as yet represented on the Schools' farm. Swine have long held an important place in the livestock division, and several hundred high grade pigs are raised annually. A fine specimen of the Large English Berkshire breed heads the pens; and no better object lesson can be offered than the "Sire is half the herd" than the results shown by this breeding. Kamehameha students take a keen interest in the Piggery division and perhaps no other department offers so great an inducement to our agriculturally inclined Hawaiian youth. The demand for pigs is greater than the supply and the profits large when carefully managed. Furthermore, the first cost to become established is small compared with other lines of animal industry, unless it be poultry, and the amount of painstaking detail involved in poultry raising in these islands, makes this branch practically prohibitive for our average Hawaiian youth, at least on a sufficiently large scale to afford them a living. However, a poultry division has been added during the past year and promises to develop into a useful division of the agricultural department.

Ample buildings and inclosures are provided for all the livestock, all constructions being the work of students, who plan as well as build under careful instruction. Farm carts, wagons and implements are for the most part constructed at the Schools' shops, where all students receive training in wood-working, forge, and machine work of a high order. All repair work is also done here, so that a valuable all round training is afforded every boy.

The dairy contains a modern equipment for the weighing and testing of milk, the separation of cream and butter-making; and for the cooling, aeration and bottling of milk, thus ensuring the best, the most sanitary practices possible, the importance of which is constantly impressed upon the students. A very complete set of veterinary instruments and appliances are also provided; the tuberculin test and all cases of minor-surgery being performed by students under supervision of the agriculturist.

Five work horses and mules do all the team and farm work, which, with the exception of one teamster is all done by the

students. Six acres are devoted to perennial grasses for fodder, an acre or two to corn, the sorghums, sweet potatoes, squash, beets, and other fodder trials, and these eight acres provide ample ruffage for some thirty to forty head of stock, which bears out the statement regarding the intensive culture generally practiced. An acre or two is given over to vegetable growing and supplies the greater part of fresh vegetables consumed by some three hundred students. Such heavy cropping is only possible by applying sound methods, aided by the exceptional climatic conditions afforded by Hawaii, where crops grow and develop to maturity every month throughout the year. Twelve cuttings of alfalfa or the Panicums, six of the sorghums, and five crops of beans per annum on the same ground, being not unusual in favored localities.

An acre of citrus and other tropical fruits just coming into bearing, completes the general equipment of the agricultural department. And being located in the semi-arid, leeward side of Oahu, the whole is necessarily provided with an adequate irrigating system.

COURSES OF STUDY.

“Practice without theory is lame.”

The course of study in Agriculture is briefly outlined in the synopsis that follows. The fifth and sixth years representing the two last school years in Manual department of the school for boys. For an outline of the work preparatory to this, the reader is referred to the Annual Register of the Kamehameha Schools; also for the general academic work given in conjunction with that of the agricultural course.

FIFTH YEAR.

THE SOIL AND ATMOSPHERE IN THEIR RELATION TO AGRICULTURE:

(Tuesdays). The origin, nature, and functions of soils, especially as related to plant production. The atmosphere in its relation to soil and to vegetation, especially from the physical aspect. Laboratory and field experiments illustrating percolation of water through soils, capillarity, water holding capacity, specific gravity of soils, flocculation, effects of lime on plastic

soils, effects of artificial mulches upon evaporation of water from soils compared with effects of cultivation and dust mulches. Mechanical soil analysis. References:—King: *The Soil*; Johnson: *How Crops Feed*; Warrington: *Physical Properties of Soil*.

PLANT LIFE WITH SPECIAL REFERENCE TO AGRICULTURE:

(Wednesdays). The internal structure of plants. The external organs of plants. The life of the plant with special reference to the phenomena of germination and reproduction. Laboratory work in the simple and microscopic examination of plants; plant sections, cell and tissue structure; sketching of same. Cultural experiments in field and laboratory. References:—Strasburger: *Text Book of Botany*; Johnson: *How Plants Grow*; Setchell: *Laboratory Practice for Beginners in Botany*.

CHEMISTRY OF THE ATMOSPHERE, THE SOIL, AND OF PLANTS:

(Thursdays). Introduction to chemistry: chemical affinity, the atomic-molecular theory. Chemical elements entering into agriculture. The chemical elements of rocks and soils as a source of food for plants. The atmosphere as food for plants. Vegetable organic compounds and the ash of plants. Laboratory experiments in agricultural chemistry. Qualitative analysis of the atmosphere, the soil and of plants. References:—Roscoe: *Chemistry*; Church: *Laboratory Guide*; Johnson: *How Crops Grow and How Crops Feed*.

AGRICULTURAL SEMINAR AND EXCURSIONS:

(Saturdays). Readings from United States Department of Agriculture publications, and discussions. Field excursions to the School Farm and to other agricultural establishments. Notes taken and written up.

Equipment: Laboratories, chemical and cultural; trial-grounds and Experimental-plots; Library containing reference books and herbarium.

AGROTECHMY OR AGRICULTURAL TECHNOLOGY:

Processes in the manufacture of cane sugar, cassava and other starches, castor and other oils; canning and preserving tropical fruits with special reference to the pine-apple, papaia (*Carica papaya*), tamarind, guava, mango, ohelo berry (*vacinium reticulatum*), poha, and other tropical fruits which will not permit of shipment in their fresh state. Spices and drugs are given some attention. Milk testing, cream separating, butter and cheese making. Equipment: General laboratory apparatus, The Babcock Milk Tester, The De Lavel Cream Separator. Museum specimens of manufactured products in various stages of completion. References:—United States Department of Agriculture Publications, and standard works.

SEMINAR, FIELD EXCURSIONS AND PRACTICE:

(Saturdays). Excursions to the dairy, piggery, and fields comprising the School Farm; excursions to rice, sugar and other plantations and mills, fertilizer works, and the experiment stations. Practice in the fields, garden, orchard and dairy. Note taking and keeping of records is made an important feature of excursions and field practice.

No text-books are used by the students in this course. It is the writer's belief that carefully prepared lectures pertaining directly to the work in hand and suited to his particular needs, supplemented by laboratory and field demonstrations, is of greater worth to our class of students than the abstract theorizing which may have their purpose with more advanced students.

Our primary object is to give our students a practical training in the science, art and business of agriculture, which may find a direct application, and at the same time to train him in ways and methods that will enable him to acquire further practical knowledge independently. *To learn to do by doing, and to think, while doing*, has been the writer's motto in all his teaching with our Hawaiian youth, and by such we hope to create a regard for industry and an appreciation of the material side of a higher civilization. Nevertheless, the reading of standard works on agriculture and kindred subjects is encouraged. Our agricultural library is extensive, and students are made acquainted with the literature of agriculture through a collection of several

thousand bulletins from foreign countries and especially from the U. S. Department of Agriculture and a large list of current publications from the Experiment Stations. The library also contains a well selected list of standard works pertaining to agriculture and related sciences, besides several of the leading farm-journals, which have done much to cultivate an interest in the department. Views of typical American farms, of fine livestock, and choice fruits and vegetables have their place also, and are freely made use of.

The great advantages possessed by the boarding-school over the day-school in the teaching of agriculture is self-evident. The best written works would be poor substitutes for well organized farm divisions, and Kamehameha Schools have spared no effort in developing the dairy, piggery, stables and farm lands; these are conducted upon scientific principles almost entirely by the students under careful supervision with the constant aim to make each step educational as well as productive.

The following schedule taken from the Schools' dairy rules and regulations will give some idea of the scope and practicability of the training offered students in applied agriculture:

DAIRY RULES AND REGULATIONS.

A. M., 4:30—Report at Dairy. Prepare and distribute feed in mangers as per ration schedule (note occasional revision). Stanchion cows.

4:45—Begin milking.

5:45—Milking must be completed, yields recorded and milk delivered by 5:50.

Feed calves—which must be fed before breakfast.

6:00—Breakfast.

6:30—Spray cows with Zenoleum mixture before liberating from stanchions. Liberate cows and give freedom of main pasture except in stormy weather. Remove all uneaten food from mangers. Clean stables. Gather fodder, cut feed and store for next meal.

7:00—Forenoon dairy work completed.

P. M., 2:35—Report at Dairy. Distribute feed in mangers. Cows must be stanchioned ready for milking by 3:40.

4:00—Begin milking.

4:45—Milking must be completed, yields recorded, and milk delivered by 4:45. Calves should be fed while one delivers the milk, and it shall be the duty of another to liberate cows, remove all uneaten feed from mangers, and clean stables by 5 p. m.

5:00—Evening dairy work completed.

SPECIAL NOTICE.

1. *Treat stock kindly at all times.*
2. *Thorough cleanliness must be observed in all the dairy work.*
3. *Never allow cows or calves to wait for fresh clean water.*
4. *Provide salt at all times.*
5. *Injury to, or inability to find any of the cows at milking time and irregularities of any kind, should be reported at once.*
6. *Punctuality, order and quietness will be insisted upon at all times. Loungers will not be tolerated about the dairy.*

The creamery regulations are even more strictly defined because the work is more complex.

The stable, piggery and other divisions are under like systematic rule.

Every three months the work lists are changed so that in the course of a year, some twenty students receive practical instruction in the dairy work, five at a time (the other divisions proportionally) with the duties equally apportioned, usually forming a squad. Senior students who may elect agriculture as their major are allowed to specialize in dairy work if they so choose, it being felt that a special field must develop in modern dairy practice ere long. Close on to one hundred and fifty students take part in some class of farm work.

By referring to the course of studies it will be seen that the work in this department is not wholly manual. The recommendations of the committee on methods of teaching agriculture of the U. S. Assn. of Am. Agri. Coll'g. and Exp. Stat's. has been largely followed in planning the agricultural courses at Kamehameha, and constant effort is made to improve the work.

Special stress is laid upon the underlying principles of all agricultural practices employed upon the farm and in the barns. The class-room work keeps in close touch with the farm operations,

and many of the field experiments are duplicated by laboratory experiments, and vice versa. In taking up the subject of fertilizers and fertilization, the chemistry of soils, plants, and fertilizers is taken up, pot cultures are made in the laboratory and plot fertilizer experiments are made in the field, and the results compared. Descriptions of vegetables are studied in the leading seed-catalogues and variety tests made in the trial-grounds, some three hundred and twenty varieties representing about forty families have been so tested and also by seasons, during the past four years, and much valuable data obtained. Several Kamehameha selections and improvements, including two crosses have been widely decimated. Balanced feeding rations are worked out from among the Hawaiian feed-stuffs and given practical tests in dairy and stable. Original research being done with the algaroba bean for stock feeding, promises practical results which should prove of value to the Islands. The first silo in Hawaii is now under way at the schools. Investigations in the methods of milking took up the attention of advanced students a year ago, and the conclusions arrived at were considered of sufficient importance by the Federal Station to publish them in bulletin form, and a prominent dairyman recently told the writer that the adaptation of some of these recommendations netted him several hundred dollars monthly.

Aside from home lessons, agricultural excursions are planned for special occasions. The U. S. Federal and the Hawaiian Sugar Planters' Experiment Station, both near Honolulu, the forest reserve, the several modern fertilizer works, sugar plantations, and model farms and gardens on the Island of Oahu are visited. The first Territorial Agricultural Fair of Hawaii proved a splendid incentive to the students, and the Kamehameha farm made one of the leading exhibits. The Annual Farmers' Institute meetings have been held at Kamehameha Schools for the past three years and from these the whole student body has derived much pleasure and instruction. Detailed reports are required from the students after all such excursions and meetings.

It is believed this training fits the earnest student for a useful life-work. Inspired with new ambitions and new ideas about farm life, with mind and hand well trained to guide the work, he may return to the country, or be the better fitted for some other occupation more or less dependent on agriculture.

F. G. KRAUSS,
Agriculturist, Kamehameha Schools.

ENTOMOLOGICAL NOTES FROM THE DIVISION OF
ENTOMOLOGY OF THE BOARD OF AGRICUL-
TURE AND FORESTRY.

By Jacob Kotinsky.

SIPHANTA OR TORPEDO BUG, (*Siphanta acuta*, Walker.)

Siphanta is the generic name of the insect generally known on these islands as torpedo bug. Being shorter and more euphonious, it is preferable to adopt it to designate the insect known so well.

The writer is unable to ascertain how long *Siphanta* has been upon these islands. At present it is known to exist upon all the principle islands of the group. It is much more numerous in some places than in others, and where it is numerous it occurs in prodigious numbers. It is still a mooted question among observers whether or not the insect is directly injurious. Some believe it to be harmless while others, including the writer, are of the opinion that it scarcely can be other than a pest. The insect occurs in largest numbers during the seasons when plants grow most rapidly and congregate in immense numbers upon the tender shoots and leaves of the plants attacked. How can a plant endure having its life blood, the sap, pumped out of it through innumerable punctures in its tenderest parts without suffering materially? Moreover, the honey dew produced by the insect falling upon the foliage, induces the growth of that dirty black fungus characteristic of the presence of scale bugs and hoppers upon a plant; in fact the *Siphanta* is a close relative to our notorious sugar cane leaf-hopper, is itself a leaf-hopper in structure and habits. But be this question of directness as it may, Mr. Koebele and others are of the opinion that it is responsible to a large extent for the distribution of the brown eye-spot of coffee (*Cercospora cofficiola*, B. & C.), so common and injurious upon these islands. This distribution of *Siphanta* probably accomplished in the following manner: The mouth parts of the *Siphanta* like those of all true bugs, are fitted for taking up food in a liquid form only by sucking. To accomplish this the insect inserts its proboscis or beak into the plant issues until the sap-carrying cells are reached and then the

pumping process begins. If this insertion was made at the point where spores or the fruiting stage of the disease were lying about, these may be carried down into the punctures where they germinate and grow or they adhere to the proboscis when it is withdrawn and carried to the next puncture. Moreover, when the proboscis is withdrawn the sap begins to ooze out of the wound and the liquid drops thus exposed make a favorable place for the adhesion of the fungus spores that may be blown about by the wind or carried by insects upon their feet. The prevalence of both the disease and *Siphanta* in coffee fields is strong evidence of the probable truth of Mr. Koebele's theory.

SIPHANTA EGG PARASITE (HYMENOPTERA; PROCTOTRYPIDAE.)

Aware of the economy of *Siphanta* on these islands, Messrs. Koebele and Perkins while in Australia a year ago, were on the sharp lookout for its enemies, since the insect came to us from that country. On October 19, 1904, the "Miowera" brought among other things a tube that contained a good many egg batches of a species of *Siphanta*, from these gentlemen. A note of this accession appears in the November, 1904, number of the *Forester* (Vol. I, p. 294). By the first of November, 1904, over a hundred specimens of parasite were bred from those eggs and distributed in two *Siphanta*-infested centers on this island. The parasite will be named and described by Mr. Perkins in a bulletin soon to be published by the Hawaiian Sugar Planters' Association Experiment Station. It is a four-winged fly of an orange yellow body and dark head, whose entire life from egg to adult is passed within the egg of the *Siphanta*. On the 5th of last month the writer in company of Mr. David Haughs, the *Forester's* Assistant, visited one of these colonies and to his delight discovered there both the fly and the tell-tale holes, evidence of its work. The good ally is thus happily established upon these islands, and if its presence achieves what is hoped for, much good shall have been accomplished. The work of its distribution is now in order; some ten colonies have been shipped to different points on this and other islands. With the co-operation of our correspondents we hope soon to have it disseminated through all points where the *Siphanta* exists.

Scutellista cyanea, MOTSH.

This is the name of a steel blue, four-transparent-winged fly which has been imported into California from South Africa where it was discovered to be an effective check against the black scale (*Lecanium oleae*, Bern.) This scale has long been one of the worst pests in the citrus orchards of California, but owing to the successful introduction of *Scutellista* the importance of this scale as a pest has ceased. Through the courtesy of Mr. Edw. M. Ehrhorn, the present Horticultural Inspector at San Francisco, a colony of this interesting parasite was received by Mr. Craw on the 25th of August. Most of the arrivals were in the pupa stage and the first dozen specimens that issued was released in and about Kapiolani park upon Hibiscus infested with *Lecanium nigrum*, Nietner. This scale was resorted to as food because *L. oleae* is exceedingly scarce in Honolulu. The parasites that issued subsequently were released upon potted Hibiscus plants infested with *L. nigrum*, confined in a breeding cage. Thirty days later ample evidence of the establishment of this important parasite in Honolulu was to be observed upon the confined plants as well as those in Kapiolani park. The evidence consisted of the characteristic exit holes in the scales, and the numerous adults flying about in the cage. The success thus attained was gratifying indeed, and particularly interesting because it was accomplished by means of another species of scale insect, and because the life cycle was here completed in 30 days, some 17 days less than is required in California. This rapidity of development promises faster breeding and hence more effective work against the scale. Some of the plants in the breeding cage were transferred to Kapiolani park and replaced by others and henceforth this Division will be in a position to supply the parasites wherever they are wanted.

FLEAS AND DISEASE.

That some insects are intimately connected with some of the most malignant diseases inflicting mankind is now an incontrovertible fact. Even the layman is at present aware that *Stygomaya fasciata* is the only vehicle by means of which yellow fever is transmitted, and that *Anopheles* is the inter-

mediary and conveyer of malaria. In a recent investigation Dr. L. O. Howard, Chief U. S. Entomologist, has proven that flies which breed in excrement convey infection by typhoid fever. These facts have led scientists to a more thorough investigation of all human insect parasites and their relation to the diseases of man.

In an article published by C. F. Baker, of the Cuban Agricultural Experiment Station, in a recent number of "Science," he calls attention to the fact that fleas have been and still are suspected of transmitting plague and leprosy. In the case of malaria and yellow fever the medical authorities could make no advancement in their study of the relation between insect and disease before the insects were properly classified by an entomologist. This is also true of fleas; nothing short of a thorough and extensive collection and careful and systematic study of this group of insects will help to advance our knowledge of its relation to the diseases mentioned. Considering that fleas are blood sucking animals, and that they move about so dexterously and can cover a considerable distance at one leap it will not be at all surprising if they are found to be the distributing agents of some of our most dreaded diseases. Mr. Baker has long been interested in a systematic study of this group of insects, and in the article referred to makes a call for an extensive collection of fleas. The writer will be glad to receive specimens of this insect from correspondents in the Territory and forward them to the proper authorities for study. Since leprosy is found upon these islands, a collection of fleas from here would probably yield much valuable data on the subject. As it is not yet definitely known whether the fleas affecting man are the same species as those affecting the animals in his environment it is well to keep separate those coming from different animals. It is advisable to secure as many specimens as possible, place them in about 50% alcohol, and label giving host, locality, elevation, collector and date. To those who are interested in the subject it is advisable to be supplied with a pair of tweezers, some small homeopathic vials of alcohol and several rat traps, as it is especially desirable to determine the relation of the fleas affecting rats and man. As parasites usually desert their hosts immediately after the death of the latter, and as fleas particularly move

rapidly, it is advisable to place a white cloth or sheet of paper beneath the animal and sprinkle freely with buhach. This will stupefy the insects and as they drop off on to the white background, they can easily be seen and picked up. The authorities promise to return reports of all specimens sent and to give credit to collectors.

LIME AND ITS USES IN VEGETABLE AND ANIMAL LIFE.

By R. E. Weir, M. R. C. V. S.

The natural formation of a large area of our coastal country is of the carbonate, or more commonly known as the limestone composition, from which is derived, after a process of burning, the lime of commerce; but the lighter and more inland parts, as well as the heavier clay lands, are not so favored in this direction, and in many instances artificial application has to be resorted to to supply the want.

As a plant food lime is, without a doubt, invaluable, and its real worth is its physical effects on the soil. On application it binds the particles forming sandy soil close together, and the more solid surface thus formed prevents undue evaporation and the moisture is retained in the ground. On the other hand, stiff clay lands are made more porous and a free passage is allowed for water and air whereby the soil is made warmer and more easy of cultivation.

Lime also hastens the decay of vegetable matter and sweetens sour lands which may have been more or less submerged. It increases the capillary condition of soil, prevents fungoid diseases, and promotes the growth of more nutritive herbage on pasture land; it also decomposes minerals on the soil containing potash and other food constituents and renders them available for the needs of the plants; further, it decomposes organic matter and promotes the important process which is so much in evidence at present, viz., nitrification.

Thus, to sum up, lime may be said to have a mechanical, chemical, and biological action, and the importance of a systematic application of this invaluable fertilizer to lands which

are at present in lack of it should be apparent to all agriculturists. When this need is supplied, many of the ailments from which stock suffer from lack of this very necessary substance in plant food will be avoided. Acidity of the stomach, so frequently met with amongst cattle that will be noticed standing in a paddock chewing bones for hours at a time, is attributable to want of alkaline matter in the food supply; malformations at birth, particularly with foals and lambs, can also be traced to the same cause. The anemic condition, often noticeable amongst cattle which have depastured for any lengthened period on light country, has the same cause of origin.—*Journal of Agriculture, W. A.*

PROTECT THE BIRDS.

Lawrence Bruner has again taken a stand in favor of the song birds of Nebraska in a bulletin recently issued from the university. To force his argument home he reasserts that a loss of \$4,000,000,000 a year is sustained by farmers and gardeners through insect ravages in the United States and Canada. Allowing twenty-five insects a day as the average diet for each individual bird, Mr. Bruner places the requirements of the birds of the State per day at 1,875,000,000 insects, estimating one and one-half birds to the acre, which would seem low enough. The number of insects to fill a bushel basket is estimated to be 120,000, and therefore it would require 15,625 bushels to feed the birds a single day, or 2,343,750 bushels for a season of 150 days. These estimates are considered low when individual birds have been known to destroy from 100 to 500 insects and vast numbers of insect eggs. To have all these myriads of insects turned loose against the crops is what it would mean to have the birds killed off, and an increase of three or four birds to the acre would mean exactly opposite conditions. It would seem that no stronger argument would be needed to prevent boys, amateurs and hunters of birds for their feathers from killing the little songsters.—*Norfolk News.*

MISCELLANEOUS NOTES.

Compiled by Jared G. Smith, Special Agent in Charge of the Hawaii
from 374 to 12,000 acres.

The government of Panama has established a school for instruction in the manufacture of Panama hats, and for the cultivation and improvement of the Toquilla fibre from which these hats are made. Twelve government scholarships have been provided and the school will accommodate 36 pupils. Most of the "Panama" hats are now made in Ecuador, "and it is hoped that in the future Panama hats will be such in reality, and not in name only, as they are today."

U. S. Consul Moffat of Turk's Island, B. W. I., says in regard to sisal growing on the Caicos Islands: An American company is cultivating 1100 acres of sisal. The government still has several thousand acres available which is offered at long leases at a nominal rental of 10 cents per acre. The fiber is equal in quality to the best grades of Yucatan, and can be laid down at New York at a cost of 3 cents per pound. The entire output is marketed in the United States.

In 1903, Java exported 25,053,104 lbs. of cassava starch worth $1\frac{1}{4}$ to $1\frac{1}{2}$ cents per lb.

The sisal industry is being developed on a large scale in Cuba. There is a rope-walk and naval supplies factory at Regla near Havana which in 1904 used 2,000,000 lbs. of Cuban grown sisal hemp, besides importing 3,500,000 lbs. from Yucatan and 2,000,000 lbs of Manila hemp. This factory produces about 95% of the twine and rope used in Cuba, and has a daily capacity of 35,000 lbs. Plans are being made to extend the area planted to sisal especially along the north coast of the island. The sisal leaves produce 10% more fiber in Cuba than in Yucatan and the fiber is equal to the Yucatan product in quality.

The sugar companies in Germany paid 9.35% dividends during 1904. This is an average on the capital stock of all the companies.—Brit. For. Off. Report, No. 3351.

Crop conditions are reported as being very bad in south-eastern China. There will be a short rice crop, causing not only suffering among the people, but reduction of their purchasing capacity.

Mr. Walter J. Ballard of Schenectady, N. Y., states that Ceylon and the Straits Settlements have between them 50 rubber producing companies. Twenty-six of these according to the British Trade Journal are tea companies, having an interest in rubber cultivation. The purely rubber growing companies have not yet paid any dividends, except one case of 7%. The companies growing tea as well as rubber, have for the most part paid from 3 to 7%, though one paid 15 and another 30%. The rubber companies have planted acreages of from 138 to 1600, and the joint tea and rubber companies from 374 to 12,000 acres.

In Great Britain only about one-tenth of the land under cultivation is occupied by the owners. More than one-fifth of the total land "holdings" are between one and five acres in extent; one-half are between 5 and 50 acres; one-third between 50 and 300 acres; and less than one-thirtieth exceed 300 acres. The very small proportion of owners to the total number of tillers of the soil is generally believed to be one of the greatest drawbacks to the British agricultural industry, and the extension of the Irish land-purchase scheme is urged as a remedy by persons who have studied the subject.

The exports of raw cotton from the United States amounted to \$385,608,673 for the eleven months ending July 31, 1905.

The world's production of silk amounted to 44,589,000 pounds in 1904. Exports amounted to 14,190,000 pounds from China; 12,177,000 from Japan, and 396,000 from India.

Exports of rice from Saigon to Europe decreased 200,000,000 pounds during the six months ending June 30, 1905, as compared with the same period for 1904.

Consul Ryder of San Juan del Norte, Nicaragua, furnishes statistics of the banana trade of the Bluefields district. There has been a decrease in the amount and value of bananas ex-

ported, from \$842,220 in 1903 to \$647,428 in 1905. This falling off is because of lower prices offered by the buyers. It is rumored that the government is soon to permit competition with the Bluefields Steamship Co. which has had a monopoly on the banana business for a number of years. Freight charges from the plantations to the coast are 16 cents gold per bunch.

Louis H. Aymé, U. S. Consul at Pará, Brazil, reports a discovery made by Dr. Huber, Director of the State Museum at Pará, that a very considerable proportion of the India rubber of commerce known as "Fine Pará" and which has always been considered to have been derived from *Hevea Brasiliensis*, is really derived from a new and hitherto unsuspected source, a tree of the genus *Sapium*. The tree bears the native name "Tapuru" and has been identified botanically as *Sapium Aucuparium* Jacq. It is polymorphic in character, i. e., the leaves vary in size and shape according to the habitat, whether the tree grows in sunlight or shadow, on rich or poor, dry or moist soils. The tree is hardy and grows with great rapidity. A tree grown in the Botanic Gardens at Pará in 5 years from seed was 8 inches in diameter, 3 feet from the ground. It grows to be 80 feet high and 3 feet in diameter.

It is reported that a plantation of 140 "tapuru" trees planted 90 feet apart, yielded 1000 lbs. of rubber annually.

The "tapuru" trees occur throughout the Amazon valley in conjunction with *Hevea*. The sap from both species is mixed and treated exactly alike.

As the tree makes a much more rapid growth than does *Hevea brasiliensis*, and as it will grow in a greater variety of soils, it seems worthy of consideration by rubber planters.

Pará rubber from Ceylon and other eastern countries where *Hevea* has been planted has long been known to be deficient in tensile strength. The new discoveries made as to the true source of the commercial grade known as "Fine Pará," i. e., that this grade is a blended rubber derived from the mixed sap of *Sapium Aucuparium* and *Hevea Brasiliensis*, seems to offer a satisfactory explanation of the inferiority of product derived from pure plantings of *Hevea Brasiliensis*.

A return relating to the cost of sugar has been prepared by the British Board of Trade and published as a Parliamentary paper. It shows the price per pound retail of the kind of sugar most largely consumed by the working classes, whether refined or unrefined, on or about March 1, 1905, in the capital cities of Germany, Austro-Hungary, Belgium, France, Holland, Russia, Denmark and Great Britain respectively, together with the Customs duty on imported sugar and the excise or internal tax.

	Retail Price. cts. per lb.	Customs Duty. cts. per lb.	Excise Duty. cts. per lb.
Germany, Berlin	5.58	2.06	1.54
Austria-Hungary, Vienna.	7.60	4.01	3.49
Budapest	7.60		
Belgium, Brussels	7.09	2.25	1.76
France, Paris	7.09	2.92	2.39
Holland, Amsterdam	9.63	4.97	4.97
Russia, St. Petersburg...	9.12	8.56	2.49
Denmark, Copenhagen ...	5.07	1.48	0.55
Great Britain, London ...	5.58	0.91	

It is not to be understood that the prices given refer to a uniform grade of sugar, but to the grades locally most largely consumed.—Journ. Soc. Chem. Industry, June 30, 1905.

In 1904, the people of the United States drank 964,000,000 pounds of coffee; 109,000,000 pounds of tea; 1,494,000,000 gallons of beer; 121,000,000 gallons of whiskey; and 43,300,000 gallons of wine.

The United States ranks first among nations in its consumption of coffee; third in tea, beer and whiskey; and, seventh among wine-drinkers. With this outlook there ought to be a promising market for Hawaiian grown coffee on the mainland.

The export of Quebracho Extract from Argentina amounted to 20,111 tons in 1904. 252,723 tons of logs were also exported. Quebracho is one of the most important sources of tannin.—Brit. For. Off. Reports.

The manufacturers of dyes and organic products in Germany produce goods valued at \$250,000,000 per annum.

Species of Sumach for Tanning purposes:

The most important Sumach is *Rhus coriaria* which is grown in Sicily, Spain, Portugal, Greece and Cyprus. The plant grows well on sunny slopes of dry, sandy, barren soil. When grown in rich soil the leaves are deficient in tannin. The leaves are dried in the sun, powdered and exported. After about 15 years' growth the shrubs cease to yield leaves rich in tannin. The tannin content of sumach leaves varies from 23 to 27 and occasionally 30 per cent.

Rhus semi-alata is native of Eastern Asia. Its galls contain 50 to 70 per cent. of tannin and are an important source of gallotannic acid.

Rhus vernicifera, native of Japan yields the "Japan lacquer," and *R. succedanea* yields "Japan wax." The leaves of both species contain small amounts of tannin.—Bulletin, Agricultural Institute at Amani, German East Africa.

Rhus coriaria is a shrub suitable for introduction into Hawaii for cultivation in the Kona districts of the islands.

ARTICLES IN THE MAGAZINES.

The Agricultural Gazette of New South Wales, September, 1905:

"State Stud Cattle Exhibited at last Sydney Show," by M. A. O'Callagon. 6 illustrations.

"Dairy Cattle at Wollongbar Farm," by C. H. Gomes. 9 illustrations.

"Cheddar Cheese-making: Canadian Sytem: Hints on Cheese-making," by W. Graham.

"Farmers' Fowls: Orpingtons," by G. Bradshaw.

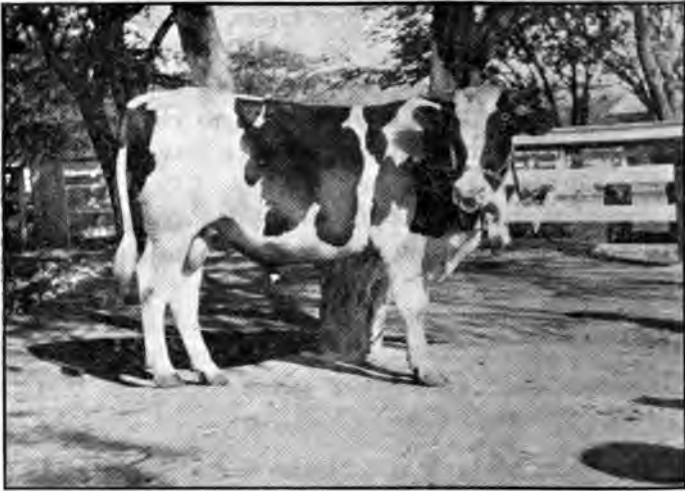
"Ducks and Duck Farming. III The Buff Orpington Duck," by D. S. Thompson.

Journal of the Department of Agriculture of Western Australia, August, 1905:

"Principles of Farm Drainage," by the Director of Agriculture.

"Notes on Fertilizers," by Percy G. Wicker.

"The Horse," by A. E. Le Sonef, Director of the Zoölogical Gardens of W. A.



HOLSTEIN FRIESIAN BULL.

COLANTHUS ONYX LAD (33175).

Imported and owned by Kamehameha Schools. Born April 8th, 1904. Gold Medalist California State Fair 1904, as Junior Champion.

SIRE, LEGEND OF SLEEPY HOLLOW (28300). The Dam, G. dam and G. G. dam of Legend of Sleepy Hollow have official records that average 25.1 lbs. butter in 7 days and 91.8 lbs. milk in 1 day.

DAM, CORONA ONYX—A. R. O. 13.6 lbs. butter in 1 week at 2 years old.

GRAND SIRE ON SIRE'S SIDE SURCUSTIC LAD (23971). Grand Champion St. Louis Exposition, 1904.

GRAND DAM ON SIRE'S SIDE COLANTHA 4TH (35028). A. R. O. 24.5 lbs. butter in 7 days. 82.0 lbs. milk in 1 day.

GRAND SIRE ON DAM'S SIDE, Onyx Clothilde (22209) Three A. R. O. daughters.

GRAND DAM ON DAM'S SIDE Corona 5th.

ARBOR DAY TREE PLANTING.

On Oct. 27th, 1905, there was issued as Press Bulletin No. 2 of the Division of Forestry of the Board of Commissioners of Agriculture and Forestry, a circular of instruction, the text of which is given in full below. A copy of this Press Bulletin was sent to the principal of each public school in the Territory, with the result that many applications for trees have been received at the Government Nursery. An account of the celebration of Arbor Day will appear in a later number of the Forester.

Suggestions in Regard to the Arbor Day Tree Planting Contest.

[Prepared under the direction of the Superintendent of Forestry.]

To fittingly inaugurate the first Arbor Day to be officially observed in Hawaii there has been raised, through the generosity and public spirit of Governor G. R. Carter and a number of firms and individuals in Honolulu, an Arbor Day Tree Planting Prize Fund. From this fund a prize to the value of five dollars is offered in each of the public schools in the Territory according to terms set forth in the report of a Special Arbor Day Committee.

The committee's report is as follows:

Honolulu, Oct. 24, 1905.

Honorable A. L. C. Atkinson,
Secretary of Hawaii, Honolulu.

Sir:—We, the undersigned, appointed by you as a committee to arrange the details of the Arbor Day tree planting contest, beg leave to report as follows:

We are heartily in favor of the proposed contest, because we believe it is based on the true spirit of Arbor Day, which is to awaken and maintain a continued interest in the planting and care of trees on school grounds and elsewhere.

To carry out the plan in a successful way, and to arouse the lasting interest of both teachers and children, we recommend:

First, that to every school making application to the Superintendent of Public Instruction, a prize of not less than five dollars in value, consisting of some object of beauty or utility, to be selected by the teachers of the school, be offered in each of the public schools of the Territory, to the grade planting on school grounds on Arbor Day, November 3, 1905, or before November 15, 1905, the tree which as the result of being well cared for is in the best condition on the succeeding Arbor Day, and that the prize be re-awarded each year hereafter under the same conditions.

Second, that the prize be the property of the grade winning it for the period of one year, that each year it have attached to it the name of the grade winning it, and a record kept of the names of the children in the grade.

Third, that the planting be done in strict accordance with the directions prepared by the Superintendent of Forestry and furnished by him to the principal of each school. These directions will be drawn up so as to cover the various conditions existing in the various parts of the Territory.

Fourth, that the trees be judged before hand by the school agent of the district, after an examination of them and consultation with the teacher of each competing grade, and the prize publicly awarded on Arbor Day.

Respectfully yours,

(Signed) RALPH S. HOSMER,

Supt. of Forestry.

JAMES C. DAVIS,

Supt. Public Inst., Committee.

DIRECTIONS FOR PLANTING.

That the plan may be carried out in a systematic way and under conditions which will insure success, the following suggestions have been drawn up by the Division of Forestry for the guidance of teachers and pupils. The directions should be carefully followed for it is not enough simply to set out a tree to secure lasting and satisfactory results. To insure success the tree must be selected with reference to the location where it is to go, must be carefully planted and intelligently cared for until it is thoroughly established. Where this is done the tree will become a valuable addition to the school ground, amply repaying the continued care given it.

WHAT PLANTING TO DO.

There should be both purpose and method in school ground planting. Trees must be so arranged as to serve both for protection and for ornament. At the same time, to grow well they must be adapted to the soil. On a small ground but little planting is possible; a group of trees or shrubs placed where they will look well or hide some unsightly feature of the schoolhouse or ground is sufficient. Instead of being continuous around the grounds the planting should be broken in places to preserve attractive views. The general condition and size of the ground, direction and prevailing wind, slope and surroundings should collectively determine the character of the planting.*

The selection of trees suitable for the different districts and localities in the Islands is a very important matter and should be made by those familiar with the local conditions and with the kinds of trees that are likely to do best.

*This paragraph, as well as a portion of the section headed *Care of Trees after Planting*, is taken from *Farmers' Bulletin No. 134* of the U. S. Department of Agriculture, entitled "Tree Planting on Rural School Grounds."

Indiscriminate planting of trees without first studying the local conditions can not be expected to yield good results. Throughout the Territory the chief factors to be taken into account are rainfall, elevation, soil, exposure to prevailing winds and the object of the planting, as, for example, whether protection from the wind is desired rather than ornamental effect.

KINDS OF TREES.

The following lists give the names of the trees which can at the present time be supplied by the Government Nursery, which are suitable for planting under the several conditions called for.

Trees best suited for windy and exposed places:

Ironwood (*Casuarina equisetifolia*).
Swamp mahogany (*Eucalyptus robusta*).
Lemon gum (*Eucalyptus citriodora*).
Java plum (*Eugenia jambolana*).
Silk oak (*Grevillea robusta*).
Monterey cypress (*Cupressus macrocarpa*).

All of the above, except the Ironwood, grow well from sea level up to an elevation of 3000 feet. The Ironwood does not do well over 800 feet.

Trees suited for clay or very heavy soil or wet situations:

Swamp mahogany (*Eucalyptus robusta*).
Lemon gum (*Eucalyptus citriodora*).
Silk oak (*Grevillea robusta*).
Monterey cypress (*Cupressus macrocarpa*).

Trees suited to very dry places:

Ironwood (*Casuarina equisetifolia*).
Silk oak (*Grevillea robusta*).
Pepper tree (*Schinus molle*).
Wiliwili (*Erythrina monosperma*).

The elevations at which trees recommended for school ground planting may best grown are as follows:

Flame tree (*Poinciana regia*), sea level to 1000 feet.
Siris tree (*Albizzia lebbek*), sea level to 1800 feet.
Monkey Pod (*Albizzia saman*), sea level to 1800 feet.
Golden shower (*Cassia fistula*), sea level to 1000 feet.
Pink and white shower (*Cassia nodosa*), sea level to 1000 feet.
Java plum (*Eugenia jambolana*), sea level to 1800 feet.
Jacaranda (*Jacaranda mimosifolia*), sea level to 1500 feet.
Swamp mahogany (*Eucalyptus robusta*), sea level to 4000 feet.
Lemon gum (*Eucalyptus citriodora*), sea level to 4000 feet.
Monterey cypress (*Cupressus macrocarpa*), sea level to 5000 feet.
Silk oak (*Grevillea robusta*), sea level to 3000 feet.
Ironwood (*Casuarina equisetifolia*), sea level to 800 feet.
Pepper tree (*Schinus molle*), sea level to 1000 feet.
Wiliwili (*Erythrina monosperma*), sea level to 1000 feet.

APPLICATION FOR TREES.

Applications for trees for the Arbor Day Tree Planting Contest may be

made to Mr. David Haughs, forest nurseryman, box 331, Honolulu, Oahu. The trees will be sent from the nursery prepaid, upon receipt of the application.

It is suggested that each of the grades in a given school plant the same kind of tree, that all may start with an even chance.

TREATMENT OF PLANTS WHEN RECEIVED FROM THE NURSERY.

The box of plants when received from the Government Nursery should be placed in a partly shaded place, as under or behind a tree or bush, where it will be protected from the midday sun. It should there remain undisturbed until the holes are properly prepared and the time for planting arrives. A sprinkling of water each afternoon is all that is required.

DISTANCE APART.

In planting for shade, ornamental or landscape purposes, trees should not be set too close together. Crowding mars the effect. Sufficient room should, therefore, be given for the full development of the branches.

Following is a list of the distances apart at which the trees named should be planted for the best effect:

- Flame tree (*Poinciana regia*), 35 feet.
- Siris tree (*Albizia lebbek*), 40 feet.
- Monkey pod (*Albizia saman*), 40 feet.
- Pink and white shower (*Cassia nodosa*), 25 feet.
- Golden shower (*Cassia fistula*), 20 feet.
- Java plum (*Eugenia jambolara*), 30 feet.
- Jacaranda (*Jacaranda mimosifolia*), 30 feet.
- Eucalypts (several species), 10-15 feet.
- Ironwood (*Casuarina equisetifolia*), 10-15 feet.
- Silk oak (*Grevillea robusta*), 25 feet.
- Pepper tree (*Schinus molle*), 30 feet.
- Monterey cypress (*Cupressus macrocarpa*), 18 feet.

WINDBREAK AND FOREST PLANTING.

For windbreak and forest planting the trees ought to be planted close, varying from two to eight feet, according to the kinds used. This point need not be further discussed here because most school ground planting is for ornamental effect.

MAKING HOLES AND PREPARING THE SOIL.

In stiff or hard soil the holes should be made three feet square and from two and a half to three feet deep. As the top soil is generally the best, it should be thrown to one side, so that it can be used around the roots of the tree when the hole is refilled. The soil should be well broken up. If convenient it is well to mix with it a few spadefuls of stable manure; the manure being thoroughly mixed with the soil. Such fertilization, where it can be done, will help the tree considerably.

PLANTING THE TREE.

If possible planting should be done on a cool, cloudy day. The hole should be refilled to within three inches of the surface, reserving the best soil to pack about the tree. The soil should be tramped lightly with the feet, leaving an opening in the center of the hole large enough to hold the tree. The tree seedling is to be placed in the soil just as it is received from the nursery, without removing it from the paper pot. After the tree has been placed in position and the good soil packed around it the soil should be tramped again, until it is properly firmed. Care should be taken not to plant too deep. The tree should be planted about one inch deeper than it was in the nursery and the surface of the ground around the tree should be almost level when the planting is finished. In ordinary situations a slight depression around the tree, to prevent the water running away when the tree is irrigated, is all that is required. In wet districts it is sometimes better to grade the earth so that the water will not collect around the tree. Water should not be applied until after the tree is planted, then half a bucketful may be gently poured on, wetting the soil immediately around the tree. If there are frequent showers or further watering will be necessary.

CARE OF TREES AFTER PLANTING.

Important as the process of planting is, much more depends upon the after treatment. In many places cultivation is absolutely essential and nearly everywhere a tree will thrive better and grow faster during its early years with cultivation than without it. The purposes of cultivation are mainly to protect the young tree from the encroachment of weeds and grass, to keep the soil about it in good condition and to retain the moisture. If planted in a dry time the tree should, if possible, be watered. This should be done by giving a good soaking once every two days for two or three months, or until the tree has got a good start, thence twice a week, and later once a week, as the roots go deeper into the soil. It should be remembered that the more careful the attention is that can be given to the tree the more likely is it to become established as a vigorous and thrifty specimen.

PROTECTION OF TREES FROM INJURY.

Protection from strong winds in exposed places is necessary until the tree gets well rooted in the soil. This may be done in different ways. Probably the cheapest and easiest plan is to drive in two stakes on the windward side of the tree about three feet apart, and to tie to them an old grain or sugar bag. One thickness is enough. Where there is danger of injury from cattle or other stock the young tree should be protected by some sort of fence. While the tree is small, stakes set about it are usually sufficient; as the tree grows larger an inexpensive frame work should be built.

Grass and weeds should, of course, be kept away from the tree until it grows large enough to rise above them, when it will take care of itself.

Throughout the planting and the subsequent care of the tree both the teacher and the pupil should bear in mind that the object of the tree planting contest is not merely to get the seedling well started, but to have it develop into a vigorous and beautiful tree which will remain for many years a permanent and attractive addition to the school grounds.

SUBSCRIPTION LIST.

Arbor Day Tree-Planting Prize.

For a five dollar prize in each of the 154 schools in the Territory	\$770.00
Gov. G. R. Carter	385.00
S. M. Damon	25.00
G. P. Castle	25.00
J. B. Castle	25.00
Alexander & Baldwin	25.00
Castle & Cooke, Ltd.	25.00
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Cash	1.00
Lewers & Cooke, Ltd.	9.00

NEW PUBLICATIONS.

Manila. Department of the Interior. Bureau of Government Laboratories, Chemical Laboratory. The Gutta Percha and Rubber of the Philippine Islands, by Penoyer L. Sherman, Jr., Ph. D. Manila, 1903, 43 pages illustrated with 41 full page plates.

Manila. Department of the Interior. Bureau of Government Laboratories. New or Noteworthy Philippine Plants. Parts II and III, by Elmer D. Merrill, Botanist.

U. S. Department of Agriculture. Office of Experiment Stations. Bulletin No. 160. School Gardens: A Report upon some Co-operative Work with the Normal Schools of Washington, with some notes on School Garden Methods followed in other American Cities, by B. T. Galloway, Chief of the Bureau of Plant Industry. Washington, 1905. 47 pages, illustrated.

Hawaii Agricultural Experiment Station. Press Bulletin No. 14. Fuller's Rose Beetle, by D. L. Van Dine, Honolulu, 8 pages: Fuller's Rose beetle is the common name of an injurious beetle known in the Hawaiian Islands as the "Maui" or "Olinda" beetle. It is referred to on the Island of Maui as the "Olinda bug," and in one district on the Island of Hawaii as the "wire fence bug," because of its occurrence on the strands of wire in immense numbers. The Bulletin in question gives data of the Life History and occurrence in Hawaii of this injurious insect and suggests remedies for its destruction.

Hawaiian Sugar Planters' Association. Division of Agriculture and Chemistry. Bulletins Nos. 1-9. Reprints. Owing to the fact that the Division of Agriculture and Chemistry of the Hawaiian Sugar Planters' Association is continually receiving application for back numbers of its publications it was found necessary to have the earlier issues reprinted. For convenience, the publications which were issued as Annual Reports during the years 1895 to 1903 are now given regular numbers in the bulletin series. Dr. Walter Maxwell's "Lavas and Soils of the Hawaiian Island" has been reprinted as special bulletin "A" and "Miscellaneous Papers," by C. F. Eckart as special bulletin "B." Bulletins Nos. 1-6 and special bulletin "A" were prepared by Dr. Walter Maxwell, Director, 1895-1900; No. 7 by R. E. Blouin, Director 1901; and Nos. 8 and 9 and special bulletin "B," by C. F. Eckart, the present Director.

Hawaiian Sugar Planters' Association. Proceedings of the Twenty-fourth Annual Meeting, 1904.

THE INTRODUCTION OF THE MANGO WEEVIL.

Honolulu, Hawaii, Oct. 16, 1905.

Editor Forester:

Under the heading "Entomological Notes" in the September number of the Forester and Agriculturist, Mr. Jacob Kotinsky charges me with laying "considerable undue stress" on the fact that the mango weevil, *Chrytorhynchus mangiferae* Fabr., is a "recent introduction." I would like to repeat just what I did say on this point in the press and in your publication. In the issue of the Pacific Commercial Advertiser of August 11th last, the first lines of an article by myself reads, "Through the columns of your paper I would like to call the attention

of the public to an apparently newly introduced insect pest of the mango." In the August issue of the Forester and Agriculturist, well along in the body of an article on this insect, I quote in connection with its distribution, injury, etc., Mr. E. A. Schwarz, an assistant entomologist of the U. S. Bureau of Entomology, as follows: "The species is not enumerated by Sharp from the Hawaiian Islands and is no doubt a *recent introduction* there." I might add that this quotation occurs also in the above mentioned article in the Advertiser. Since these are the only places where I use the expression "recent introduction," twice in as many articles, they must be the places to which Mr. Kotinsky refers and to which he takes exception. I, as well as Mr. Kotinsky, would seek to inform the reading public, if, as he says, the term "recent" as used in writings of this character conveys the idea of "a few weeks or months," that the term as used by Mr. Schwarz does not necessarily imply so short a period but in this particular case refers to the time since the publication in 1900 of that part of the Fauna Hawaiiensis dealing with the group of beetles to which this species belongs. As the collection of the species therein recorded by Mr. R. C. L. Perkins ceased some two years previous to this date, the term "recent" in this case is seen to range over a period of about seven years ago to the present time.

As regards my own statement in the Advertiser to the effect that the mango weevil is "an *apparently* newly introduced" insect, I use the word "newly" in the same sense as "recent" is ordinarily employed. Mr. Kotinsky quotes Mr. Perkins as saying that the time of its introduction was at least three years previous to its being noticed in numbers. In my opinion it is at the most within this time and probably within the two years before it was discovered (last July) by Mr. Higgins of this Station. Although it undoubtedly has not been introduced since the entomological inspection of the Territorial Division of Entomology began in August, 1904, it might easily have been. The very nature of the habits of the insect during its developmental period within the seed of the fruit would permit the most rigid inspection without disclosing its presence. In fact several shipments of seeds have arrived during this time. In so far as I have been able to trace these

shipments, none were weevil-infested, a known fact from the practice of removing the husks before planting the seeds. I am in possession of considerable data on the appearance of the beetle in one or two localities last season where it could not have been overlooked had it occurred previously and yet where in spite of the facts that it is a special mango pest and has an extended life-cycle it occurred in thousands. Not knowing the rate of increase, it would be difficult to say just how many generations or broods would be necessary to bring about this condition. I do not just see how the opinion of Mr. Perkins as an authority on the *Hawaiian fauna* has special significance in regard to a species recently introduced and concerning which little is known regarding its injury, length of life-cycle, habits, or rate of increase.

The trend of Mr. Kotinsky's remarks are to the effect that my article was reflective on the work of the institution of which he is an assistant. I have gone thus at length into the matter to defend my statements but would now disclaim any intention on my part of misleading the "general reader" as to the effectiveness of the local entomological quarantine and inspection work. I consider the establishment of this work under the direction of Mr. Alexander Craw as one of the most important moves in the history of economic entomology in the Hawaiian Islands. The whole point from an economic standpoint as regards whether or not the mango weevil is a recent introduction is the fact that if introduced within the past year or so and therefore limited in its distribution over the Territory, it can perhaps be confined to this Island or possibly by proper quarantine regulations stamped out altogether. Because of the power bestowed upon it and its responsibility in the matter some action will no doubt be taken by the local Board of Agriculture.

Very respectfully yours,

D. L. VAN DINE,
Entomologist, Hawaii Experiment Station.

DRYING HERBS.

In answer to an inquiry by a reader in the *Agricultural Gazette* of N. S. W., Mr. A. A. Dunncliffe gives the following reply:

"Herbs, such as sage, thyme, etc., may be dried for market or home use. They are cut at the time they are coming into flower, taking all the last growth, say, from within an inch or so from the crown of the plant. The crop must be dried thoroughly, and this must be done in the shade to preserve the color and quality; then they should be packed in whatever air-tight packages that may be convenient, or such as may be adapted to the trade intended to be established. The 'butchers' herbs frequently come from America, tightly packed in 200 and 400 gallon iron tanks. The herbs are saleable in Sydney. A minimum price, wholesale, of sage is 4d., and thyme, 5d. per lb. Sometimes the price advances in accordance with the state of the market. If the business is to be done on a large scale, a proper drying apparatus would be necessary, which would involve the employment of capital—anything between £100 and £1,000. But it would be better to work in a small way at first, to get experience and to demonstrate the ability to produce a marketable article at the necessary prices."

NOTICE.

The current *Forester* has unavoidably been delayed beyond the usual date of publication. In order to expedite the remaining numbers of 1905, contributors who have promised assistance, will please note, that it is intended to go to press with the November and December issues, on Dec. 1st and Dec. 15th, respectively.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. II.

NOVEMBER, 1905

No. 11

Among the many advances which are being made in the development of the Agricultural resources of the Territory, not the least important is the importation of choice new blood into our island herds of cattle. Every thoroughbred sire of improved type introduced to the islands and intelligently bred, leaves a permanent impress on our livestock industry. It is desirable to encourage in every way the importation of thoroughbred cattle, although no greater incentive could be offered than the pecuniary remuneration which accrues from the possession of choice animals. The Forester will be glad to receive photographs of noteworthy animals, to publish in continuation of the series it has already commenced.

We are fortunate to be able to publish this month an interesting contribution from Judge P. L. Weaver, on the organization and objects of the Hawaiian Poultry Association. The writer is already known to our readers as the author of the address given before the Research Club and published in the February issue of this year, upon the legislature requisite to protect the family homestead. As one interested and actively engaged in the establishment and development of our island resources, Mr. Weaver writes with the authority of practical experience, and it is safe to predict that the Association of which he is President, will under his direction be established on such a basis that it will long continue to influence, for the benefit of the whole community, the standard of poultry in these islands. The amount of money which is spent at the Coast by our consumers upon products which should be produced here, is enormous, and in the aggregate continually depletes the prosperity of the Territory. Apart from any other consideration, any undertaking which tends to foster home production to the exclusion of outside competitors is worthy of support, and as such an organization the Forester wishes the Hawaiian Poultry Association unqualified success.

The work of Mr. Alexander Crow and his associates in repelling the introduction of blight and insect infested fruit, is, we are gratified to know, meeting with success and the recognition and support of all who have the welfare and future prosperity of the Territory at heart. Isolated as she has been in the past, Hawaii is now, through the development of new commercial routes, peculiarly at the mercy of the depredation of noxious pests, the introduction of some species of which would not only despoil but even imperil the very existence of the Territory as an agricultural country. It is only by continual vigilance that we can hope to exclude the exotic pests which have too often wrought the ruin of whole agricultural industries. The difficulties which are being experienced here are by no means peculiar, and we intend to draw attention in our December number to what is being done in this matter in other countries.

RUSH GROWING.

The agricultural department of the University of California, experimenting in co-operation with the Oakland Board of Trade on the propagating of rushes on the Elmhurst marshes, has made the discovery that the tule will grow so well there that it will more than rival the matting rush hitherto imported at great expense from Japan and China. Professor Arnold V. Stubenrauch of the University of California has just completed an examination of the plantation started last year on land at Elmhurst, donated for the purpose by M. J. Kerwin. He found that the juncus rush, which had been planted on the marshes, had grown remarkably, despite the discouraging conditions under which it was set out. His measurements found rushes that were from twenty-six to thirty-two inches long from root to tassel. As the Eastern manufacturers have said they could readily use rushes twenty-eight inches long, the experimenters feel that this part of the investigation has been successful. There is so much faith in the experiment that 2,000 more roots will be planted. The United States Department of Agriculture, attracted by the success of the venture in Alameda county, has ordered large shipments of the roots to be sent to North and South Carolina and Florida, to be set out on the marshes there.

THE OBSERVANCE OF ARBOR DAY.

The first Arbor Day to be officially observed in Hawaii proved a great success. The idea was received with much favor, and the day, Nov. 3, 1905, was generally observed throughout the Territory.

Arbor Day has everywhere come to be chiefly celebrated in the schools and to be associated primarily with school ground planting. This held true for Hawaii, but the observance of Arbor Day in the islands did not stop with the schools, for many individuals and improvement clubs took as active an interest in the day as did the school children and did their full part in setting out trees.

The Arbor Day Tree Planting Prize, made possible by the liberality of Governor G. R. Carter and of the other gentlemen and firms in Honolulu who contributed to the fund, gave an added incentive to the interest taken in the day, as was attested by the number of schools applying to the Government Nursery for trees to set out. The corrected figures showing the number of schools actually entered in the contest have not yet been received from the Superintendent of Public Instruction, but it is known that over two-thirds of the public schools in the Territory took part in the Arbor Day exercises.

The following table gives, by islands, the number of schools to which trees were sent from the Government Nursery, with the number of trees sent.

Island.	Schools.	Trees.
Kauai	7	1,215
Oahu	24	425
Maui	17	604
Molokai	4	206
Lanai	1	26
Hawaii	42	1,719
Total	95	3,101

As a number of the schools obtained their trees locally, from individuals and from plantation nurseries, it is hard to estimate the total number planted, but the figure is much larger than that given above.

Following suggestions drawn up by Mr. James C. Davis, then Superintendent of Public Instruction, the exercises in the differ-

ent schools were generally similar but each school had some individual or characteristic feature. In the programs music and recitations alternated with brief talks about the origin and history of Arbor Day and everywhere a special point was made of arousing the lasting interest of the children in the trees set out. This was in fact the keynote in all the exercises and is perhaps the most encouraging feature in the observance of the day, for on the subsequent care given the trees planted on Arbor Day depends in large measure the success of the undertaking.

It should be noted here that to Mr. Davis really belongs the credit of getting the Arbor Day celebration actually under way. It has many times been proposed but not until this year has any one actually got the movement started.

The celebration of Arbor Day was not confined to the public schools. At the Kamehameha Schools public exercises were held and class and other trees planted, among them rows of *Albizia lebbek* trees along a new entrance drive-way which is to be known as "Agricultural Lane."

Oahu College took an active interest in Arbor Day by furnishing trees for street planting in the College Hills Tract. One or two trees were planted in each block on the afternoon of Nov. 3rd, to mark the day and start the work; the others will be set out by the residents later in the month.

Perhaps as active work as any has been done by the Waialae, Kaimuki and Palolo Improvement Club, which is preparing to plant street trees on a considerable scale on Thanksgiving Day, thus combining two good objects in one celebration.

On the other islands Arbor Day was observed with fully as much interest as in Honolulu. Outside of the public schools perhaps the most noteworthy celebrations were at Mooheau Park in Hilo and in the Public Square at Lahaina, where a goodly number of trees were set out amid much enthusiasm. But everywhere throughout the Territory real interest was taken in the day and it deserves long to be remembered as one marked by a red letter—or perhaps better in this case, by a green one.

FIGHTING INSECT PESTS WITH INSECTS.

By Alexander Craw.

On November 22, 1905, the following paper was read before the Hawaiian Sugar Planters' Association by Mr. Alexander Craw, Superintendent of Entomology for the Territory of Hawaii:

Mr. Chairman: At the request of Mr. Swanzy I herewith present a short paper that may be of interest to the members of the Hawaiian Sugar Planters' Association and others engaged in the agricultural and horticultural industry of this Territory.

I am given to understand that a few years ago Hawaii was free from plant pests and blight. Roses, pinks and other choice flowers, could be gathered in abundance, free from blemish, although our flower stores, markets and venders even now have always a liberal supply and are famed for their wealth of flowers done up into bouquets, leis and other floral devices to decorate our departing or returning friends. This is a beautiful custom and peculiar to Hawaii. It is no unusual sight to see the native men and women going to work or business with their favorite flowers encircling their hats, or necks. We naturally feel grieved for any injury done to the beautiful in nature, but when the financial interests of a community are affected by such imported insect pests and blights, efforts are immediately devised to exterminate them or control their destructiveness. This has usually been a recourse to insecticidal solutions in the form of sprays, or poisons applied to the infested plants, or by covering the trees or plants with an air tight tent or canvas and applying the necessary amount of hydrocyanic acid gas. In the case of nursery stock or imported trees and plants they are fumigated with the above gas, or the fumes of carbon bisulphide in specially prepared fumigating chambers, or boxes; such treatment is usually efficacious except in the case of mining or boring insects and all such infested stock is condemned and destroyed by burning.

The above are the usual artificial methods of insect control, but nature has a cheaper and much more effective method that in recent years has become recognized as the most rational

and feasible way of fighting our insect enemies, and that is to send experts to the native habitat of the pest and there study up the parasitic checks to such pests. These again unfortunately have what are known as secondary parasites that prey to a certain extent upon the primary species, and these the experienced collector guards against by breeding them out before sending, or cautions the entomologist at home to see that none issue and scape from the breeding jars or cages. In some cases at least fifty per cent. of the beneficial insects are thus destroyed, so when we obtain the parasites without this check we are more successful with them than they are in their native country.

Dozens of species of formerly destructive insects can be enumerated that have been brought under subjection by parasites or predacious insects, and once introduced are no further expense to the orchardist or planter. The introduction of insects that attack other insects can never become a pest to vegetation any more than a tiger can become a ruminant, so must have the insects upon which they prey to exist. In this method of warfare against insect pests we do not look for extermination, but rather to keep in check their destructive numbers.

The introduction of *Vedalia cardinalis* into California from Australia and later into Hawaii, South Africa, Portugal and Florida from California to prey upon the "white" or cottony cushion scale, was considered by several of the foremost entomologists as "an extraordinary case and would probably never be again repeated." The fact of the matter was that the *Vedalia* only confirmed and strengthened the faith of the advocates of nature's methods, who observed former beneficial results from parasites and predacious insects. Mr. Ellwood Cooper, State Commissioner of Horticulture of California, was one of the strongest advocates of fighting pests with natural enemies, and has urged upon the legislature of that State to make appropriations for conducting the search for more. In this he has been ably supported by the fruit growers, who recognize the value of the work to the State's principle industry. Compare California and Hawaii's policy with that of Massachusetts. The latter has spent millions of dollars in a futile effort to stamp out the "Gipsy" moth that was unfortunately introduced from Europe. It spread destroying not

only fruit trees, but ornamental plants, shade trees and even forests. Notwithstanding the expenditure of vast sums of money the authorities were unable to even check its spread. An effort is at last to be made to introduce and spread its natural enemies, and if intelligently conducted cannot fail to be a success. It is hardly necessary to enumerate the various beneficial insects that have been introduced and the wonderful work accomplished by them. The *Cryptoloemus* introduced by Prof. Koebele saved the coffee and other plants from destruction as effectively as the *Vedalia* saved the citrus industry, and the *Rhizobius ventralis* practically stamped out the "black scale" (*Saissetia oleae*) on the Islands and the *Scutellista cyanea* is rapidly doing the same in the olive, lemon and orange groves of California. The "Codlin moth" that was introduced into the United States from Europe and now causes an annual loss of millions of dollars to the apple and pear growers of the country, may be checked by a parasite recently introduced into California from Southern Europe by George Compere, beneficial insect collector for California. This parasite is reported to be breeding freely, not only in confinement, but also in the orchards of that State. Mr. Compere is at present traveling in China to secure the parasites of the "purple scale" that is known to keep that pest in check there. If he succeeds we will undoubtedly secure colonies from Mr. Cooper.

I will now briefly mention one or two matters that will more especially interest our own people. The sugar planters too, well know the destructiveness of the "leaf-hopper" that was said to have been introduced from Queensland only a few years ago. Matters became so serious that the Hawaiian Sugar Planters' Association and the Hawaiian Territorial Board of Agriculture and Forestry determined to send two experts to search for its parasite. Professors Koebele and Perkins were selected and commissioned to carry out this important work. They sailed from Honolulu on May 11, 1904. In August and September we began to receive consignments of lady-birds that they found feeding upon aphids and scale insects which were liberated on cane aphids, and others bred in confinement. During this time Messrs. Koebele and Perkins were conducting close observations and breeding out internal parasites of the "cane leaf hopper" to ascertain if there was any danger from secondary parasites and then began to collect and ship

material to Honolulu. The preliminary shipments were not in good condition and no parasites bred from them. However, on October 3rd, the S. S. "Ventura" arrived with several packages of material, and through the courtesy of Collector of Customs E. R. Stackable, I was granted permission to take possession of the packages, and a few days later the first of the parasites of leaf-hopper eggs began to issue, and on the 8th of that month Mr. F. W. Terry of the entomological staff of the Planters' Association and the writer took the tiny insects to the Oahu Plantation, where the manager had a special locomotive and car meet us at the depot and we were taken to portions of that extensive plantation, over their private lines, where we liberated that and later several subsequent lots. On December 28th Mr. Terry and I visited Oahu Plantation where we secured leaves infested with hopper eggs from which we bred the parasites. The following day Mr. Terry made a more extensive examination and found that the parasites had spread naturally a distance of over sixty yards in each direction from the original colonies. I suggested the immediate distribution of the parasitized material, but it was considered by Mr. W. M. Giffard advisable to defer this work until the arrival of Prof. Perkins, who was expected early in January, and as the hopper eggs were in abundance, there was no possible danger from a short delay. Mr. Perkins arrived on the S. S. "Miowera," January 12th at 7:30 p. m., having a further supply of beneficial insects and new internal parasites for the eggs of the leaf-hopper which he had cared for on the voyage. On April 5th Mr. Koebele arrived and brought several varieties of new sugar cane upon which we found some mealy bugs under the leaves and a number of "bud worms," one Buprestid beetle, also a few cane borers. I fumigated the cane. Mr. Koebele only received the cane shortly before the steamer sailed, so that he had no time to inspect it. On July 24th the S. S. "Manuka" arrived from Australia via Fiji, and Mr. McClanahan of Honolulu was a passenger thereon. In his baggage was found a piece of sugar cane on which I found a "bud-worm" that was half an inch long. It had eaten the heart out of a bud. The cane I placed in the fire on board. Mr. McClanahan said that he only brought the cane because of its extra size.

On April 20th Professors Koebele, Perkins and I visited

Oahu Plantation where we found evidence of the good work of the egg parasites, they having spread from the valley to the table lands. As you are all aware, the Hawaiian Sugar Planters' Association Experiment Station entomologists have been sending strong colonies of these and other parasites all over the Territory. Mr. Perkins recently informed me that over fifty per cent. of the leaf-hopper eggs have been destroyed by the introduced parasites.

When you take into consideration the fact that all this has been accomplished within a year from the time that the first small colonies were liberated, we can reasonably look for more wonderful work before the close of another year. After that it is my opinion that the sugar-cane leaf-hopper (*Perkinsiella saccharicida* Kirkaldy) will be so scarce that no damage will result from its presence in the cane fields of Hawaii and only enough leaf-hoppers left to keep the parasites with us.

THE MANGOSTEEN.

We have received the following information from Mr. Gerrit P. Wilder:

"I have succeeded in germinating two seeds from some of the fruit sent to me by Francis Gay of Makaweli. These plants are now four inches high, strong and healthy, and I believe are the first plants to be successfully grown from Island fruit. Mr. Gay informs me that he has not been able to sprout any of the seeds on Kauai."

NOTICE.

The next regular meeting of the Farmers' Institute of Hawaii will be held at the rooms of the Bureau of Agriculture and Forestry in Honolulu, on Saturday, December 2nd, at 7:30 p. m.

The following program will be presented:

The Balanced Ration and Stock Feeding—Mr. F. G. Krauss.

Forestry Work in Hawaii During 1905—Mr. R. S. Hosmer.

Agriculture in Hawaii—Mr. Jared G. Smith.

The Coffee Industry in Hawaii—Mr. A. Louisson.

All those who are interested are cordially invited to be present at this meeting.

(Signed)

J. E. HIGGINS,
Secretary.

FORESTRY IN HAWAII DURING 1905.

The following reports and letters outlining the progress in forestry in Hawaii during the past year, were read at the annual meeting of the Hawaiian Sugar Planters' Association, on Nov. 23, 1905.

The report of the Association's Committee on Forestry and the letters from Messrs. Forbes and Lydgate were read by Mr. L. A. Thurston. The report of Mr. Ralph S. Hosmer, Superintendent of Forestry for the Territory, was read in person.

REPORT OF COMMITTEE ON FORESTRY

To the Hawaiian Sugar Planters' Association.

Gentlemen:—The time has come around to again take stock in trade, as to the status and progress, or otherwise, of forestry in Hawaii.

Naturally the chief development of the year has taken place through the Bureau of Agriculture and Forestry, although it is to be noted with satisfaction that more than one-half of its members and representatives throughout the Territory are members of this Association. A growing disposition is also being manifested both on plantations and ranches, to both establish reserves and plant trees, not only along roads and ditches, but in groves.

FOREST RESERVES.

Act 44 of the Laws of 1903, which was passed largely through the efforts of members of this Association, created the Bureau of Agriculture and Forestry. Chief among its objects are the setting aside of suitable areas and locations, both of government and private lands, as forest reserves.

During the year last past, through the procedure provided by the law above referred to, five forest reserves have been set apart: one on Kauai, one on Oahu, one on Maui and two on Hawaii.

The reserve on Kauai is in the District of Hanalei, and contains a total area of 37,500 acres. Of this area 10,990 acres are government land, and have been formally set apart in manner prescribed by law as a forest reserve. The Board is nego-

tiating with the owners of the remainder, for its conditional surrender to the government.

The reserve on Oahu is in the District of Koolauloa and contains 913 acres all of which is government land, and has formally been set apart.

The reserve on Maui is in the District of Koolau and Hamakualoa, on the north slope of Haleakala, covering approximately 42,969 acres, of which 15,083 acres of government land have been formally set apart. Of the remainder approximately 18,000 acres are government land under lease for more than two years, which fact, under the provisions of the existing law, prevents the formal setting apart thereof for the present. This latter area is for all practical purposes reserved, however, for the leases under which it is held restrict the use thereof to purposes not injurious to the forest.

The reserves on Hawaii are first in the Hamakua District, consisting of 18,940 acres of which 17,000 are government lands, formally reserved. This reservation is the mountain section on the north side of the Kohala mountains, lying between the Waipio valley and the Kohala district.

The second Hawaii reserve is the belt of forest lying along the northeast side of Mauna Kea, extending from the Hamakua boundary to the lava flow back of Hilo. The makai boundary is at an elevation of 1750 feet at the Hilo end, extending along a gradually rising line to an elevation of 2000 feet at the Hamakua boundary. The mauka boundary is approximately along the upper line of the woods.

The total area of this reserve is 110,000 acres of which 12,771 acres of government land not under lease have been formally reserved. The other government lands within the reserve being under lease for more than two years are not available for present reservation. The great bulk of this reserve, however, consists of private land, and the public spirit and private interest of these owners must be relied upon to make the reserve effectual.

METHOD OF DEFINING RESERVES.

It will be noted that in each of the reserves mentioned, with one exception, only a part of the land within the reservation is government land, or if government land, only a part thereof is available for present formal reservation under the law.

The question has been raised as to why so-called reserves are made to cover land which is not available or obtainable for present reservation.

The reply is that very early in the work of setting apart reserves, the owners of private lands involved did not want to agree to set apart lands for forest purposes or to express an opinion as to what should be set apart until they knew exactly what was proposed on broad lines as a forest reserve; they desired also to have some say as to where the completed reservation lines should be placed.

The policy adopted by the Board of Forestry has therefore been to make a thorough examination of the locality in which a reserve is proposed, and suggest a comprehensive plan of what should be set apart as a forest reserve, irrespective of ownership or present availability for reservation.

This comprehensive plan is then submitted for consideration by both the public and the owners of private lands. These broad lines have been arrived at in each case after the fullest consultation with the government land commissioner, the local land owners and the local interests generally. So far no objection or opposition has been made to the reservation lines finally proposed by the Board, and the Governor has in every case adopted the lines recommended by the Board.

PRIVATE CO-OPERATION.

In connection with all the reserves so far made there has been the heartiest co-operation and manifestation of desire to co-operate with the Board of Forestry on the part of the owners of lands lying within the several reserves.

No private land owner has actually surrendered any land to the government as a part of a forest reserve, however, although in many cases they have voluntarily fenced out cattle from their lands and created practical forest reserves without such surrender.

The inducements held out to land owners to surrender lands to the government for forest reserves are first, exemption of such surrendered lands from taxes; second, the securing of government inspection to prevent injury to and interference with the forest; third, the securing of expert care, supervision and development of the forest; and fourth, the

moral value of the example set in inducing others to give support to the forest reservation policy.

The newness of the proposition, together with the uncertainty as to what the future policy of the government will be in connection with the continuance of the forest reservation policy, has so far prevented the consummation of any surrender of private lands for forest purposes; but the proposition has been elaborated with great care between the Board of Forestry and the Alexander & Baldwin plantations on Maui, in connection with the forest lands of the latter in the Koolau and Hamakualoa Districts on the windward coast of Maui.

The plan proposed contemplates the surrender of the land to the Board of Forestry for a period of years, with a view to seeing how the proposition works out in practice. The owners reserve to themselves the right, subject to the rules and regulations of the Board of Forestry, to reforest the surrendered area and make such economic use of the forest products, both natural and those planted by themselves, as shall not be inconsistent with forestry purposes, and to resume possession and control of the surrendered land if the government withdraws its land from the reserve.

This proposition is now before the several Boards of Directors of the corporations interested, and agreements along the lines indicated will probably be concluded within a short time.

As soon as this sample arrangement is completed, copies thereof will be published and submitted to other land owners holding lands within forest reserves, with a view to extending the policy on the same general lines.

ECONOMIC USE OF FOREST RESERVES.

In this connection it should be brought home, more particularly to owners of land within forest reserves, that a "forest reserve" does not necessarily mean the locking up of a reservation and its abandonment to jungle growth.

In some cases, for example on the mountain section between Hamakua and Kohala, there is no probable use that can be made of the reservation except for water conservation. Under such circumstances the best use to be made of the reservation is to secure the greatest growth possible of vegetation

and all that should be done is to assist nature by reforesting the open portions of the reservation.

In many other localities, however, for example in portions of the Hanalei, the Maui and the Hilo reserves, and in others now under contemplation, there can be, without detriment to the main object of maintaining the forest, economic use made of many of the now standing trees as well as by planting trees which can hereafter be made economic use of. In the earlier stages of the forestry program the main effort is directed towards establishing reserves, and later more effort will be directed to reforesting and making economic use of forest products.

REFORESTING AND PLANTING.

Owing to the financial condition of the Territory, the last Legislature did not feel able to make any appropriation for a general reforesting and planting program. The Bureau has not therefore been able to take up this work on any large scale.

It is, however, working on two lines in this connection: first, the collection of seeds of valuable trees which are disposed of at the cost price of collection. Large quantities of seeds of the more valuable trees in Hawaii, including the Acacias, the Eucalyptus and the Iron woods, have been made. This is important work, as a large proportion of the imported seeds do not germinate. The prices charged for the seeds are small—much cheaper than they can be imported for.

The second branch of this work being carried on by the Bureau, is the giving of advice and instruction as to the best trees to be planted in particular localities and how to propagate, transplant and care for them. This service has been appreciated, and a constantly growing call upon the Bureau in this connection has been noted. The Bureau would be glad to have more use made of it in this respect. On request a representative of the Bureau will go to any portion of the Islands, lay out a nursery and give instructions as to how to care for the same, the expenses of course being borne by the persons for whom the work is being done. No charge is made for the services of the instructor.

AMENDMENTS TO FORESTRY LAW.

Two amendments to the forestry law were made by the last Legislature.

One was to render the law setting apart reserves more flexible than was the previous law. Under the law as it existed, it required an act of the legislature to remove any land from a reserve once it had been reserved.

Under the amended law the Governor may, with the approval of the Land Commissioner, after a meeting at which all interested have opportunity to be heard, take out specific portions of the reserve for specific purposes.

Although this amendment gives power to take lands out of a reservation which perhaps should not be so taken out, it is believed that the requirement of a public hearing and the growing understanding of the value of forest reserves will prevent undue exercise of the power, while at the same time it removes the fears of some that land suitable and proper for homesteading will be locked up in forest reserves.

The other amendment to the forest law of the Territory is Act 71 of the Laws of 1905, providing for the protection of forests from fire. This act specifically makes the willful, malicious and negligent setting of fire on any land not owned or controlled by the person setting fire thereto, and the wilful, malicious and negligent allowance of escaping of fire from the land of the person who sets it, on to the lands of another whereby any property of another is injured, a misdemeanor.

The act also provides for the appointment of district fire wardens in each district of the Territory, who have power and authority to act in case of fire in their several districts. Fire wardens have been appointed from among the most responsible residents of the several districts.

ECONOMIC FORESTRY.

Among the developments of the past year, looking toward the creation of economic value from forest sources, is the probability that rubber will prove a profitable crop in this Territory. The Hawaiian Department of Agriculture imported a number of rubber seeds some six years ago which were distributed throughout the Territory. In many places these

seeds have grown and the trees are well developed and producing even now a good article of commercial rubber; and several thousand trees have already been set out and are doing well in the Nahiku District on the windward slope of East Maui. There is every reason to believe that the business of planting rubber trees will be engaged in on an extensive scale in a number of different localities in the Territory at an early date. For forestry purposes rubber trees are as good as any other variety, while they possess the additional value of producing an incidental profit.

THE BLACK WATTLE.

The other tree of economic value which I wish to call attention to, is the *Acacia decurrens* or Black Wattle, a tree which is common in many districts throughout the Territory.

In connection with the Tantalus forest there were planted some twelve or thirteen years ago a lot of six acres of this tree. The location was a rocky one with poor and shallow soil. The grove was included in the portion of the area set apart for the Federal Experiment Station. As the trees were not in a healthy condition Mr. Jared Smith, the superintendent of the Experiment Station, caused them to be cut this last spring, the bark removed and sold for tanning material and the wood sold. Careful statistics were kept by him of the results obtained from this small area. By his kindness I am able to present such results to this Association, which are as follows:

The six acres yielded 500 first-class fence posts which were used as samples and given to tanneries.

Thirty-six tons were sold at \$23.31 per ton realizing a total amount of \$839.44.

The six acres yielded 500 first-class fence posts which were used upon the station. These posts, if purchased, would have cost 25 cents a piece, making the value received from posts \$125.

In addition to the fence posts there was realized 88 cords of fire-wood which was sold at an average of \$7.83 per cord, producing a total of \$689.25.

Allowing the same price for the two tons of bark given away there would be an additional value of \$46.62.

A summary of the amount produced by these six acres of Black Wattle is then as follows:

36 tons of bark sold.....	\$ 839.44
2 tons of bark given away.....	46.62
500 posts	125.00
88 cords of wood.....	689.25

Making a total of.....\$1,700.31
or equivalent to \$283.38 per acre.

As stated above the soil on which this grove was planted was rocky, thin and poor and the trees scrubby.

To my personal knowledge, in good soil on Tantalus and a number of locations on Hawaii and Maui, this tree grows to twice the size of the trees cut on Tantalus in much less time.

I am also informed by Mr. Smith that the Black Wattle bark is one of the best of the tanning barks, and the average price of good bark is much higher than that realized by him, the low price being on account of this being an experiment, its individual character being not yet established.

I am also informed by Mr. Smith that the demand for tanning bark is practically unlimited.

The foregoing demonstration by Mr. Smith opens up an entirely new field for a profitable industry in Hawaii, either as a proposition by itself or more particularly as an incidental profit in connection with plantations which are now having to purchase their fire-wood.

The tree is a quick grower, and planted along the lines of roads and in barren spots should furnish all the fire-wood needed by the plantation, leaving the bark a net profit.

ARBOR DAY.

The establishment of an annual Arbor Day in Hawaii stands to the credit of the year 1905. Although probably a majority of the trees planted out on that day will die, largely through ignorance of the proper method of caring for and transplanting the trees, the importance of this advance cannot be over-estimated, as it will be the means of interesting a vast number of people in tree propagating and growth and their education in connection with such matters, who otherwise would never have had their minds turned in that direction.

ADDITIONAL FOREST RESERVES.

Mr. Ralph S. Hosmer, the Territorial Forester, has now

well under way studies and reports upon forest reserves in Kohala, Kau and North Kona, Hawaii; the Ewa-Waianae basin and Waialua, in Oahu, and Kapaa and Kilauea on the island of Kauai, all of which it is hoped will be in condition to be acted upon and definitely set apart as forest reserves at an early date.

DESIRABLE AMENDMENT TO LAW.

As noted above the existing law does not permit the Governor to set apart as a forest reserve any government land on which there is more than a two years' lease.

This provision has not worked well. The theory upon which it was put in the law in the first instance was, that as the reservation could not go into effect until after the lease had expired it would make little difference whether the reservation were made now or at some time in the future when the lease had expired. It was also thought that it was preferable to set apart land for forest reservation only when the land was available for such purpose and not at a period prior thereto.

In practice it has been found, however, that the ability to now locate a forest reserve has considerable to do with the action of private owners in connection with their lands desired to be included in the reserve.

If government land which manifestly ought to be in a forest reserve can be now formally included therein, such inclusion to become effectual at the expiration of the lease, adjacent private owners know definitely what to calculate upon, whereas, if a part only of such government land is set apart and the remaining part is left in uncertainty to be dealt with in the future, the conditions are entirely different. The private owners interested and all concerned being left in uncertainty as to what will finally be included in the proposed reserve.

The plans for forest reserves should be as homogeneous and on as definite lines as possible. Uncertainty as to what is to constitute a reserve is as injurious to the main object as is uncertainty in any other proposition.

It is the opinion of all interested in the subject, to whose attention the matter has been brought, that the law should be so amended as to allow the Governor under the ordinary procedure, to set apart any government land for forest reserva-

tion purposes whether the same is now under lease or not, the reservation to take effect upon the expiration of the lease, unless other arrangements can be made with the lessee, which can frequently be done.

There are appended hereto copies of communications from J. M. Lidgate and D. Forbes, other members of the Committee on Forestry.

L. A. THURSTON,

Chairman, Committee on Forestry.

REPORT OF J. M. LYDGATE.

Lihue, Kauai, Oct. 3, 1905.

Mr. L. A. Thurston,

Chairman, Committee on Forestry.

There seems little to report concerning forestry on Kauai that is not already contained in the report of R. S. Hosmer, Supt. of Forestry. All that I know of since that report, is the completion of the McBryde forest fence and the fact that Koloa plantation is now engaged in setting out some 10,000 trees.

I think a good many places employ two or three men regularly planting and taking care of trees, and everywhere one sees signs of interest in this way.

The trees mostly planted so far as I have seen are Ironwood, Grevillia, Eucalyptus, Koa and Japanese plum. The latter tree in places is spreading naturally. On the lee side of the island Algaroba and Inga are valuable trees, easily grown and spreading naturally.

The ravages of cattle are being reduced to a minimum on this island—partly because the forest lands are being fenced off and partly because the lantana has choked up the trails and open glades. Goats and hogs exist in the mountain regions, but do not seem to injure the forest seriously, at least in the wet regions.

Respectfully yours,

J. M. LYDGATE.

REPORT OF D. FORBES.

Kukuihaele, Hamakua, Hawaii, Nov. 14th, 1905.

L. A. Thurston, Esq.,

Chairman of Committee on Forestry,

Honolulu, T. H.

As a member of your Committee on Forestry I beg to sub-

mit a brief review on some of the work done in aid of forestry throughout these Islands during the past year.

Through the spirited efforts of your Forest Commission and their able assistants, backed up by an interested Executive, more has been accomplished towards the reclamation of native forests than in any like period of the writer's experience on these Islands. A number of reserves have been created in various districts throughout the group, and although there remains much to be done in this line, a start has been made, which let us hope may lead to the formation of sufficient forest areas to meet the necessities of all agricultural pursuits.

The introduction of a "Real Arbor Day" has undoubtedly struck a most vital point in the future preservation and increase of our island forests for although the impression may not be left on the minds of all children who have planted a tree on that day, undoubtedly will leave with many a subject of interest and thought, who, in the future, will stand up and champion the protection and preservation of the reserves we now endeavor to create for them.

The Rubber Industry which, although, in its infant stage on these Islands, is evidently here to stay, will, let us hope, prove a success; adding in no small measure to the area of Exotic trees constantly being introduced with, attached to it that never failing impetus for continued planting, the inducement and hopes of a few stray per cent. as a reward for the energy and effort bestowed. So far as the benefits of forest go in ameliorating our island climate, it is of little moment whether it be a pine or a rubber tree, and if there is more revenue derived from the latter, let it be planted. Undoubtedly the tree giving off its usefulness to man without its final destruction must be the best tree to plant. This industry we will anxiously watch and earnestly wish that it may eventually reward the efforts and enterprise of those interested in its welfare.

Since considering the work of past years in the furtherance of forest timber production, it seems to the writer that there is much left for us to do in the preservation of the timber now being used or that intended for use in the future. I have no data at hand to demonstrate the measurement of timber yearly consumed by our island planters but conclude it

reaches several millions of feet. Now let us assume such lumber to cost \$30 per 1,000 feet and is intended for use in erection of flume, bridging, or R. R. ties, etc., and that the life of this timber under normal conditions is from 4 to 8 years and that for the half of its original cost the life of this timber can be doubled; will not all of us want to know how? This process of timber preservation is now long past the experimental stage in Europe, where as here lumber is expensive; each of the leading R. R. companies have their own "Creosoting" plants in which R. R. ties, telegraph poles, fence posts and pickets undergo treatment; while even now in the United States where lumber is much more plentiful the process is meeting with favor.

To install such a plant for timber treatment is expensive and I doubt if any single plantation would care to take it up, although several might jointly do so with economy.

A brief description of the plant now in the writer's mind may be of interest and is as follows: A long cylinder-shaped boiler eight feet in diameter with a swing door at either end similar to our Deming juice heaters; in this cylinder is stored the lumber for treatment. The swing door is then closed absolutely tight to resist a high pressure. From an adjoining supply tank boiling hot creosote is pumped into this cylinder until it has reached the innermost cells of all the timber being treated. This is ascertained by time and pressure and the quantity of material being treated. In the machine referred to, which held 6,000 sup. feet of timber, two charges were a day's work and always complete within ten hours. So soon as the curing is complete the creosote in machine not absorbed by timber is drained off and ready for use in succeeding charges. In tests made in the writer's presence of 10"x12" Scotch Fir R. R. ties, a timber similar to our N. W., after treatment the tie was cut through the center longitudinally and found to be thoroughly saturated to its innermost cells. As an example of its preserving qualities the common Scotch Fir used for R. R. ties was found, after five years under heavy traffic, to be no longer safe; with treatment its life was prolonged to ten years, thus in a great measure supplanting the Larch so much in demand for this purpose. The Larch no doubt would also, with similar treatment, be made to last

proportionally longer if so desired, although the writer has no knowledge of its results with such treatment. The introduction of such a plant is not likely to be pushed by our local timber merchants, although I have every confidence it will well repay the cost to all consumers of timber for whatever purpose its use may be desired. I remain,

Yours respectfully,

D. FORBES.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Mr. President and Members of the Hawaiian Sugar Planters' Association.

The report of your Committee on Forestry has outlined the essential facts in the history of forestry in this Territory during the past year, but there are certain points to which I wish to call the especial attention of the members of this Association.

It is not necessary today to describe the organization of the forestry work under the Territorial Board of Agriculture and Forestry, nor to enter into a dissertation upon the desirability of protecting the forests on these Islands. The necessity of forest reservations on the important watersheds throughout the Territory is perhaps more apparent to you than to any other body of men in these Islands, and forest measures have always had the hearty support of this Association. There are, however, some features of the forest policy of this Territory that are not as well understood as could be wished,—of these I wish to speak.

The work of the Division of Forestry for the past year has followed closely the program adopted when the Division was organized, not quite two years ago. The creation of forest reserves has held first place and has occupied the greater part of my own time as Superintendent. During the year five reserves have been set apart in the Territory; two on Hawaii, one each on Kauai, Oahu and Maui. The five reserves have a combined total area of 210,322 acres, of which 56,757 acres of government land have been actually set apart by proclamation by the Governor.

Following is a list of the reserves, with data as to their creation, area, date of proclamation, etc.

FOREST RESERVES.

No.	Name	District	Island	Area Govern- ment Land Ac- tually Reserved	Total Area Rec- ommended to be reserved	Date of Pro- clamation	Proclamations Signed by
				Acres	Acres		
1	Kaipapau	Koolauloa. . . .	Oahu . . .	913	913	Nov. 10, 1904	Geo. R. Carter
2	Hamakua Pali. . .	Hamakua	Hawaii . .	17,000	18,940	Dec. 23, 1904	Geo. R. Carter
3	Hilo	Hilo.	Hawaii . .	12,771	110,000	July 24, 1905	A. L. C. Atkinson
4	Koolau-Maui . . .	Koolau, Hama- kua-loa	Maui . . .	15,083	42,969	Aug. 24, 1905	A. L. C. Atkinson
5	Halelea	Halelea	Kauai . . .	10,990	37,500	Aug. 24, 1905	A. L. C. Atkinson
				56,757	210,322		

The procedure of making forest reserves in Hawaii and the relation between the total area within the reserve boundaries and the area actually set apart may be thus described.

Following an examination on the ground, the Superintendent of Forestry recommends to the Board of Commissioners of Agriculture and Forestry the reservation of the area, which in his judgment should, for the best interests of all concerned, be kept permanently in forest. If the Board approves this report it adopts a resolution favoring the reserve. A public hearing is then held by the Governor and the Board for an expression of opinion. If no opposition develops, the Governor by proclamation recommends the reservation of the area suggested by the Superintendent of Forestry and actually sets apart such government lands within the boundaries of the reserve as are not under lease, or on which the leases are within two years of expiration. Thereafter the other government lands within the reserve are set apart as their leases expire. The individuals and corporations owning or controlling land within the reserve are asked to cooperate with the Board, under the law, that by the adoption of an organic system of forest management, the objects for which the reserve is created may be attained. Except as the owners cooperate with it, the Board can exercise no jurisdiction over the private lands within the reserve.

The general attitude of the present administration on the forest policy of the Territory was summed up in a correspondence between Governor Carter and myself, which was made a part of the report submitted by your Committee on Forestry last year. Since that time several points in the policy have been more clearly defined in consequence of questions which have come up relative to the location of, or another of the reserves.

...ant change, there should be men-
...ment of Act 44 of the Ses-
... of the Revised Laws), by Act
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Commissioner, more than existed within the limits

of forest reserves, which changed economic conditions may make available for development. On the whole I approve of this amendment, although I believe that it would have been better had the approval of the Board of Commissioners of Agriculture and Forestry, as well as of the Commissioner of the Public Lands, been required.

This brings up the matter of the location of the boundary lines of the forest reserves, with reference to possible agricultural land. It is the settled policy of the Board of Agriculture and Forestry to fix the boundaries so that all land likely to be needed for agricultural development shall be excluded. In the location of the reserve boundary lines the possibility of the agricultural development of the section is always taken into account and the line wherever possible, is so laid out that it may be a permanent one.

There are, however, one or two districts where with better transportation facilities, successful agricultural development could be pushed further than is feasible under existing conditions, but where, until the success of such development can be assured, the land serves a better purpose by being kept under a forest cover. In such localities it is sometimes advisable to draw a forest line that may later be modified. But in most cases the attempt is made to so draw the line now that the reserve include land which is suitable only for forest. By so doing there is little occasion for the new law to be invoked, but being on the books it prevents opposition to proposed reserves which might otherwise develop.

Perhaps next in importance to the creation of the reserves is the question of securing the co-operation of the corporations and individuals owning land within the reserve boundaries. As was explained above, the Governor and the Board in declaring the boundaries of a given reserve go on record as recommending that for the best interests of the Territory as a whole, the given area be permanently reserved as forest. The administration then shows its good faith by actually setting apart the government lands not then under lease and, subsequently, the other government lands as the leases on them expire. In some reserves the major part of the area within the boundaries is government land, in others the proportion of private holdings is as great as that of the government lands.

That the reserve as a whole may be administered to the best

advantage, it is essential that a systematic and organic plan be adopted and carried into effect. This cannot be done if a number of diverse, perhaps conflicting, interests have each a voice in the management. For this reason the Board of Agriculture and Forestry requests the private owners to entrust to it the management of their lands, under the provisions of the law creating the Board. The exact form of agreement to be entered into by the individual and the Board, whereby this end can be accomplished, is one of the problems on which the Board is still working. It will doubtless be found that like all reserve work, each case must be decided on its own merits and with special reference to individual conditions, but these are details which will work themselves out, in due course.

The main object of the Board at present is to secure the interest and co-operation of the private owner, for without unity of purpose and harmony of action, the reserves cannot be made of the most use to the Territory. Very unfortunately the lack of available money in the treasury entails a particular hardship on this branch of the work. Money for the pay of forest rangers was cut out of the last appropriation bill altogether, leaving the Division of Forestry at present in the anomalous condition of having forest reserves, but no force with which to administer them. This lack of men to carry a definite policy of forest reserve administration into effect has and will deter the private owner from turning over to the Board the management of his forest land. In several instances an arrangement has been made through the employment of what are practically volunteer rangers, which will serve for the present, and I think give good results. But this can only be regarded as a temporary expedient. The condition is one which must be remedied or our reserve system will never be efficient.

It is to this end that I particularly desire to obtain the assistance of this Association, for if the Board of Agriculture and Forestry can go before the next Legislature with a definite proposition of a series of forest reserves, in part composed of private lands, on which the owners will co-operate with the Board, provided a system of forest administration is put into effect, there is good reason to expect that the necessary money for the employment of forest rangers can be obtained.

I am confident that once the conditions are understood the money will be forthcoming. Consequently the creation of new

reserves is being steadily pushed. Next year I expect to report the addition of large areas to the present list of reserves.

There is necessarily much preliminary work which must be done in the field and in the office before a given forest reserve can be set apart. At the present time many projects are under way in various stages of completion. In the comparatively near future it is expected that forest reserves will be created in Kau, Hawaii, in the Ewa and Waialua Basins on Oahu, on the Kohala Mountain on Hawaii, and in the District of Puna on Kauai. Plans are also well in hand for the creation of reserves on the West Maui Mountain, on the Waianae Hills on Oahu, and on Lanai, while the examination of lands on the leeward side of Kauai and on Molokai, will be undertaken as soon as may be.

While on the question of forest reserves there is one other point which should be mentioned—that is the attitude of the Board of Agriculture and Forestry regarding the great stretches of waste land on the higher mountains of the Territory. It is the policy of the Board to recommend that the portion of a land above the area of profitable grazing country be retained by the Land Office when the valuable portion of the land is again leased, instead of as now being thrown in as a sort of “manuwahi.” Much of the upper land could be made to grow valuable forest trees. It may be that sometime in the future this work can be undertaken. Therefore it is well that the land remain in the hands of the government rather than that it be granted to private persons for a long term. A case in point, when this policy was carried into effect, was the land of Kaohe 4, on Hawaii.

So far as possible the Division of Forestry is carrying on other lines of forest work, although the limited appropriations at the disposal of the Division greatly retards many things which we should like to do.

The giving of advice and assistance to individuals or corporations desiring to do forest tree planting is perhaps the most important work of the Division of Forestry, next to the creation of forest reserves. Upon request, Mr. David Haughs, the Forest Nurseryman of the Division of Forestry, will visit and inspect the land which it is desired to plant, and give advice in regard to the kinds of trees best adapted for the locality, with suggestions as to the best methods to be followed to insure success. If a large area is to be planted it is recommended that local nurseries be started in which the seedlings to be used can be

grown. When only a few hundred are needed they may be obtained at cost price from the Government Nursery in Honolulu, as may also the seed of the more important island and introduced trees.

A circular is about to be issued offering the advice and assistance of the Division in a more general way than has been done heretofore, which it is hoped will be followed by numerous applications. There is no charge for the advice given beyond the payment of traveling expenses of the agent sent.

Among the features of the past year's work worthy of special mention, is the forest fire law enacted at the last session of the Legislature. The act is carefully framed and will, it is believed, be of much benefit to the Territory. To call the attention of the people to the law and to awaken a sense of responsibility among those who set fires which might spread to the forest, fire warning notices have been printed on cloth and very generally posted throughout the Territory. District Fire Wardens have been appointed in the several districts on each island to carry out the provisions of the law. By these means it is hoped that much may be done to prevent fires in the future, the best way to combat this worst enemy of the forest.

It is of interest also to mention the successful celebration of the first Arbor Day to be officially observed in Hawaii. The day selected was November 3rd, and while essentially a day of school-ground planting, a good share of interest was aroused throughout the community which can but lead to good results.

Altogether the past year has been a favorable one and shows good progress. But the field for forestry in Hawaii is a large one and there is much which waits to be done.

If we are to make the most of the undoubted opportunities that exist here we shall continue to need the support of all who have at heart the welfare of the forests of these islands. That support assured, the outlook for the future is bright.

THE PURPOSES OF THE HAWAIIAN POULTRY ASSOCIATION.

For some time past those residents of the Hawaiian Islands who are interested in poultry have noticed the large importations of dressed poultry and eggs from the Pacific Coast, and the comparative small supply of such produce from the home farms. It was known that standard fowls are a comparatively rare bird with the exception of those of a few fanciers, and that anything that wears feathers was considered sufficient to start a breeding pen. Those fanciers who knew what standard pure-bred poultry meant, found that they could find no market sufficient to encourage them, because of the general ignorance of the value of fine stock.

It has been a problem in the Hawaiian Islands after the breeding pens were acquired to keep the young stock alive during the growing period, when attacked by the diseases peculiar to these semi-tropic islands.

It became evident that a mutual exchange of information as to the treatment and cure of disease, a trading of experience, would enable the poultry fanciers to avoid going over the same ground which had already been traveled by the other experimenters in fighting the many enemies of the domestic fowl in these islands.

With these objects in view about twenty residents of Honolulu met in the rooms of a local society to organize themselves into a poultry society, for mutual benefit, under the name of the Hawaiian Poultry Association.

A constitution and by-laws were adopted and passed to print; and monthly meetings have been held since the organization on April 20th, 1905.

At these meetings papers have been read on the cure of disease in chickens, there has been a valuable exchange of experiences in the treatment of disease, as well as on the prevention of disease. Various theories have been advanced as to the cause, prevention or cure of the disease known as "sore-head," but little of such a formal manner as to make a set article for print has been rendered. The result of the experiences detailed by the many experimenters is a confirmation of the germ theory of this disease and plans to fight it on that theory. There have been many remedies recommended, in addition to extreme cleanliness in the chicken houses and runs; among the less favorable are painting the affected parts with creoline, carbolic vaseline, but the favorite

remedy proves to be hydrogen-dioxide. This is especially valuable because it oxidizes the sore part and cleans it out, instead of forming a scab underneath which the disease still eats into the flesh of the bird.

It has been found that pigeons are affected with the same disease known as "sore head" when about three weeks old, which renders them unfit for market at the time when they are about to become marketable. No remedy has been reported other than the same ones used for chickens. Even extreme cleanliness does not seem to check this disease in pigeons.

In addition to the subject of disease the matter of breeds to be preferred in this climate has been up for discussion, but without any unanimity of opinion on the subject as to any one breed preferable to others. White fowls are favorites in all varieties.

The association has been preparing for the December poultry show ever since last spring. We had the whole subject to study, and much correspondence to carry on by means of individual members in learning the mode of carrying on a show, and in drafting out exhibition rules to fit our requirements. These rules are now printed and ready for distribution, with entry blanks for any one in the Territory desiring to exhibit poultry.

The members have been careful to leave the first show open to the competition of all persons whether members or not, so that the greatest amount of interest will be taken by the greatest number. It is also a line of policy to allow any one to compete with any bird, whether imported or domestic, thus to encourage the importation of fine stock and improve the breeds now here. It is well known that birds bred here are often inferior in weight or color to the imported birds, their parents, by reason of the influence of the tropic sun. It was decided finally to put all birds on an equal footing because of the desire to encourage the importing of birds for the present. The show is to be held on Merchant street, Honolulu, on December 7, 8 and 9, and promises to be a surprise to Honolulu, in the variety of pure bred birds exhibited.

It is hoped that this show will arouse interest in fine poultry, and improve the breeds here owned. With an improvement in the stock, the aim of the society is to supply the home market from the home farm with eggs and dressed poultry, in competition with the imported article, and thus to add to products of Hawaii other than sugar, and to encourage the small farmer in the building up of the Territory by diversified industries.

It is believed that eggs and poultry can be produced here in competition with the imported article from the coast, and it is the purpose of the Association to demonstrate this in addition to encouraging the fancy for show birds.

PHILIP L. WEAVER,
President of the Hawaiian Poultry Association.

BEEF TYPE V. DAIRY TYPE FOR BEEF PRODUCTION.

The Iowa Station has recently reported the results of a year's feeding test to determine the relative economy for beef production of the beef and dairy types of cattle, a question which is receiving much attention at the present time. The results attained are summarized as follows:

Dairy type steers show a considerably higher percentage of offal and a lower dressing percentage.

Dairy type steers carry higher percentage of fat on internal organs, thereby increasing the total weight of cheap parts.

Beef type steers carry higher percentage of valuable cuts.

Beef type steers furnish heavier, thicker cuts; they are more evenly and neatly covered with outside fat, show superior marbling in flesh, are of a clearer white color in fat, and a brighter red in the lean meat; but there is little difference in fineness of grain.

The low price paid for dairy steers may be due partially to prejudice, and to the greater expense of carrying and selling the lower grade carcasses; but it is chiefly due to an actual inferiority in the carcasses.

It is neither profitable nor desirable to feed steers of dairy type for beef purposes. They are unsatisfactory to the consumer because they do not furnish thick and well marbled cuts; they are unsatisfactory to the butcher because they furnish low grade carcasses which are difficult to dispose of, and they are decidedly unsatisfactory to the feeder, because they yield him little or no profit, and both breeder and feeder waste their time in producing such a type of steer for beef purposes.

Philippine Census for 1903, Vol. IV, pages 67-69, the plan of shipping copra alone is advocated. Though the India Refining Company of Philadelphia, referred to above, at present imports all its raw material from India and Ceylon in the form of coconut oil, the firm is of the opinion that the easiest, safest and quickest way to ship coconut oil is in the form of copra. All the production of the Philippines and other Pacific islands received here has been so shipped.

The India Refining Company stands ready to purchase copra, if it can be procured in large and constant quantities, at East India prices. The following prices per hundredweight have been quoted recently:

At Colombo	\$2.90 to \$3.10
At Trinidad	2.90 to 3.00
At Hamburg,	
East African	3.50 to 3.80
West African	3.00 to 3.60

Very respectfully,

B. T. GALLOWAY,
Chief of Bureau.

India Refining Company.

McKean & Swanson Streets.

Philadelphia, Oct. 30, 1905.

Mr. Ralph S. Hosmer,

Supt. of Forestry,
Honolulu, Hawaii.

Dear Sir:—Your esteemed favor of the 11th inst. is before us, and we should think that copra could be produced in your Islands in commercial quantities and made a pretty important and valuable article of commerce.

The best copra is made by drying the meat of the coconut in houses or drying machines heated by steam, although if the climate is a sufficiently dry one, sun drying produces very good results if the meat is kept clean. The grading depends on the dryness, cleanness and sweetness of the meat.

The market price varies considerably: we have seen it as low as \$50.00 or \$52.00, and as high as \$85.00, per long ton. The present price in London is about \$80.00 or \$81.00 per ton.

There is no market at present in this country, unless possibly with the American Linseed Company, who have a mill in San Francisco, and we would suggest your writing to them. We trust you will be successful in stimulating some interest in this product, as it is one rapidly growing in importance and it would hardly be possible to overload the market.

Yours very truly,

INDIA REFINING COMPANY,

W. H. MAGOFFIN,

Treasurer.

MISCELLANEOUS NOTES.

Compiled by Jared G. Smith, Hawaii Experiment Station.

The Black Wattle industry of Natal, although only twenty years old, has become one of the most important in South Africa, and exports of bark during 1904 were value at \$350,000. There are at present over 30,000 acres planted. T. R. Sim, conservator of forests in Natal, states that there is no other forest tree capable of extensive cultivation, which yields a return in so short a time. Complete felling may take place at any period after five years of age, although ten years is nearer the average age at which the trees are cut. The average yield amounts to five tons per acre of dry bark and thirty cords of dried timber. The bark when dry is chopped, shredded or ground and bagged in three bushel sacks, weighing when full, about 184 pounds. At Dalton, which is one of the principal centers of wattle production, the price paid for dried bundled bark ranges from \$30.00 to \$32.00 per ton, and for bark that had been ground and bagged, \$35.00 to \$37.50. It costs \$1.50 per ton freight from the interior to Durban, the shipping port, and \$5.00 per ton from there to Europe. The wood is sold for fuel at from \$1.25 to \$5.00 per cord, while heavy mine timbers bring about double that price. Mr. Sim states that "The first requirement in wattle culture is an ability to grasp local conditions and adapt every detail of the work to meet them. The amount of variation in products as well as in results being extraordinary."

Mr. Theodore F. Borst, in an address on forest planting for profit, delivered before the "Massachusetts Horticultural Association," states that from careful observation of the planting of forests in New England, white pine plantations will yield a net annual return of \$1.15 per acre, at the expiration of forty years, in addition to 4 per cent. compound interest on the money invested. Indeed, a calculation of costs shows that a return of about \$2.25 per acre for forty years from the time of planting to the time of cutting is obtainable. This estimate has been corroborated by actual experience. These returns are considered entirely satisfactory as the land used for the production of a timber crop is such as is almost useless for grazing or any other agricultural pursuit. A timber crop not only gives a return on the money invested but it makes productive the capital locked up in the land. These figures were obtained from a forest which had been absolutely uncared for during the whole period of its growth; if scientific forestry treatment had been given, the returns should have been much higher.

According to the 1900 census, the production of fruit in the United States amounted to \$1.74 per capita. Commenting upon this fact, Professor John Craig, of Cornell, states that the greatest fruit market of the world is the American workman and that his staple fruit is the apple. While the production of fancy fruit is one which appeals to any one who goes into any branch of this industry, as a matter of fact the fancy fruit market, with its high prices, amounts to only a very small percentage of the whole field. A cheap market on the other hand is one capable of almost indefinite expansion. There is no reason why the banana growers of Hawaii should not recognize this fact and endeavor to secure the almost unlimited market for their fruit which does exist during the months from January to June, at which time apples are usually scarce and always high in price.

A warning has been issued to West Indian growers of Sea Island cotton, that they should not under any circumstances permit this crop to ratoon, because there is not only a falling

off in yield per acre but also a marked decrease in the value of the crop of ratoon cotton as against one of plant. The fibres are weaker, short and uneven, and, furthermore, the continued growth of any annual crop on the same lands during a number of seasons or during a number of years leads to the abnormal increase in number of insect pests and fungus diseases.

Much attention is being given in the English colonies to methods of packing bananas for shipment to the London and European markets. A package containing 800 individual fruits is being quite largely adopted and where individual bunches are shipped, they are almost invariably crated or shipped in barrels with appropriate wrappings. Care taken in handling the fruit has as much to do with getting it to market in good condition, as proper storage facilities on ocean steamers.

The government of Bengal, India, has sent four students to Cornell University to take postgraduate work in Economic Entomology, Agronomy and Plant Breeding. All four are graduates of Calcutta University.

It is announced in the *Chemist and Druggist*, that among other prizes Dr. Henri de Rothschild has recently offered one of \$600 for the best study on the supply of milk to a large city (hygiene, technology, transport, legislation, sale, etc.). This prize may be held should the jury of award consider it desirable. The competition is open to foreigners, and papers are to be sent to the Secretary, 100, St. James Street, London, W., before the 1st of August, 1906.

The Cornell University Experiment Station, Cornell University, Ithaca, N. Y., is now open to the public. It is a large and well equipped station for the study of the various phases of agriculture and horticulture.

THE VEGETABLE GARDEN.

BY F. G. KRAUSS.

To complete, within the year, the general cultural notes of the list of vegetables enumerated in "Garden Vegetables Suitable for Hawaii," of the "Vegetable Garden" in the January issue of the F. and A. will necessitate rather briefer treatment than was given in the earlier "Notes," and seasonableness of application will needs be set aside in the remaining two issues of Vol. II. For planting seasons the reader is referred to the "Monthly Garden Calendar" which appeared in the February issue of this magazine. The remaining varieties will be taken up alphabetically as with those heretofore.

SWEET CORN.—*Zea mays*.

F. mais sucré. G. mais. P. milho.

Corn may be said to be an all-season crop in Hawaii, almost to the extent that beans are. In contrast with the temperate-zone, however, the least favorable season with us seems to be the hot, dry summer months of June, July and August, at least in the leeward districts, when water for irrigation becomes scarce, and the aphids and like pests are most troublesome. Fine corn, however, was seen at Waimea on Hawaii during the latter part of July this year. Doubtless at higher elevations these months may prove among the most seasonable in locations. At Kamehameha we make sowing every month excepting those mentioned, and at the present writing have a choice lot just coming into ear, and another sowing was made to-day (December 1st) which should be ready to harvest on February 1st unless drowned out by excessive rains. We find it profitable to produce sweet corn at 15 cents to 20 cents per dozen ears, which would suggest export possibilities for this season of the year.

To grow corn to perfection, a deep rich sandy loam, sufficiently retentive of moisture is best, though heavier soils, especially if rich in organic matter, and well drained produce fine crops. No crop repays deep, thorough tillage better than corn; the plant is a cross feeder and drinker and unless a large root-area is provided failure is sure to result.

We plant in drills in preference to hills; when planting in

squares, hill planting allows horse cultivation both ways which is of course a labor saving method when large areas are planted, but when the corn is planted in drill a more even distribution is obtained and crowding is avoided. Furrows should be plowed three feet apart and a seed dropped every two or three inches. When four to five inches tall thin out to eight or ten inches apart in the row. As the plant grows fill in the furrow gradually until the adjoining ridges have almost been leveled. Keep the soil mellow and free from weeds by frequent shallow cultivations; too deep cultivation tears the surface feeding and supporting roots and is frequently worse than no cultivation at all. The varieties that succeed best in California seem most suitable for Hawaii, and among these Early Mammoth Sugar, sometimes called Alameda Sugar, and Stowell's Evergreen are best. Burpee's Ex. Er. Cosmopolitan and Golden Bantan have also done well with us. Country Gentleman, which is a great favorite in the Eastern States, does not do well at Kamehameha. For popping, Queen's Golden and Rice popping are standard sorts with which we have also succeeded. Anyone having sufficient area to make the growing of field corn worth while, should try a good strain of Golden Beauty, Improved Leaming and Large White Dent. We have had some fine large ears of all three varieties, but our acreage is too limited to grow this crop in sufficient quantity.

Corn-breeding has become a fine art within the past decade, and to begin right, seed should be obtained from a seed corn specialist.

CUCUMBER.—*Cucumis sativus*.

F. concombres. G. gurke. P. pepino.

The cucumber likes heat but cannot endure drought. A light mellow soil is best, though good crops are frequently grown on heavy soils so long they are not permitted to bake and crack. Plow deeply and thoroughly. Mark out the ground five feet apart each way and at the intersection incorporate a large shovelful of well rotted farm-compost. In the hills thus formed sow eight or twelve seeds, which will allow for half being destroyed by insects. When the plants begin to send out runners thin to the best three or four plants remaining. Keep the ground well cultivated and free from weeds.

A good preventative from insect injury is to dust the plants with pyrethrum (Buhach, insect powder), hellebore, or tobacco dust, especially on the under side of the leaves. For a few plants it is worth while to protect the fruits with mosquito-bar netting. The planting of radish or turnip seeds with the cucumbers has been recommended as some insects will attack these in preference to the main crop.

Frequent gathering of the fruits as they attain a satisfactory size tends to lengthen the bearing season of the plants, and permitting the fruits to ripen on the vine is certain to cut the season short. For a list of varieties suitable for our conditions see "Notes for January."

EGG PLANT.—*Solanum melongena*.

F. aubergine. G. eierpflanze. P. bringela.

A few egg plants should find a place in every home-garden; they are exceptionally easily grown in Hawaii and when well-prepared are liked by almost everyone. While classed as a tender plant in California they thrive throughout the year here when once well established, single plants having borne continuously for a year with us. It is not exacting in soil conditions, and resists hot dry weather well. To produce large tender fruits, the soil should be well enriched and if cut back occasionally they will continue to bear for a long time.

There are practically only three varieties, as follows: N. Y. Imp. Large Purple, Black Pekin, and Georgian Pearl, the latter an attractive white variety. All have done well at Kamehameha.

LETTUCE.—*Lactuca Sativa*.

F. laitue. G. salat. P. alface.

Lettuce is a universal favorite, but few who are acquainted with the Chinese method of culture are willing to risk its use. But as there is no excuse for any one with a piece of ground five feet square, or for that matter, a box of soil, from having a continuous succession of crisp fresh lettuce, no one need be deprived of this refreshing vegetable. The secret of growing tender and sweet lettuce is to force it into rapid growth, a rich loam, well drained and kept mellow by frequent stirring, and possibly protection from a too fierce sun are the main requirements.

Sow the seed thinly in shallow drills twelve inches apart; thin out early, leaving the most vigorous plants for early heads. If a cool, cloudy day be selected the thinned plants may be transplanted with good results.

To force growth occasional light dressings of nitrate of soda may be applied in the irrigation water. As the plants begin to head select the largest for table use and the remainder will often develop to an immense size, retaining the delicious crispness, so much sought after in this favorite salad plant.

The varieties are exceedingly numerous and are usually grouped under two classes, cabbage lettuce, and cos lettuce, the former the roundish more solid heads under which comes the L.g. Passion, Imp. Hanson, Prize Head, California Butter, Denver Market, Big Boston, Deacon or San Francisco Market, and Giant Crystal Head are all good sorts. The "Cos" varieties are tall growing with narrow, elongated leaves forming a rather loose head. They require tying to cause the inside leaves to blanch. When carefully looked after the leaves are of fine quality for salads. Paris White Cos is an old standard sort, Trianon Cos has large firm conical heads which blanch to a beautiful white when tied.

The non-heading or "cutting lettuce" or curled varieties mature quickest but are not so popular as the other classes, still, the Morse, Blk.-seeded Simpson and Grand Rapids should be given a trial.

MELONS.

THE MUSKMELON.—*Cucumis melo*.

F. melon. G. melone. P. melao.

THE WATERMELON.—*Citrullus vulgaris*.

F. melon d'eau. G. wasser-melona. P. malmia.

Were it not for the ravages of the cut-worm, plant lice and the melon-fly, these crops would be delightful to grow in Hawaii, but our advantages from the absence of frost are about offset by the prevalence of insect pests. However, good melons and many of them are grown here annually, especially of the watermelon.

The muskmelon or cantaloup (the terms are used interchangeably here) have not so wide a range in Hawaii as in

California, and it is rarely that choice island fruits are seen in our markets. We have succeeded in raising very finely flavored but rather small specimens, and this seems to be the report generally.

The general cultural directions given for cucumbers applies to this crop also, except that the hills should be about eight feet apart each way. California Large Nutmeg, Burpee's Netted Gem (Rocky Ford), Paul Rose or Petoskey, Large Hackensack, and Jenny Lind are standard varieties, the three first of which have succeeded best with us.

The watermelon succeeds better than the muskmelon in Hawaii, and the alert gardener, if favorably located, need fear few failures, though a second and even a third planting sometimes becomes necessary to obtain a full stand. Check of well prepared, preferably a light sandy loam, as for muskmelons, and supply a generous supply of well rotted compost to each hill, which will give the vines a strong quick start. If this is done a week or two before the seed is sown all excessive heat will have been dissipated and a more natural growth will result. Plant eight or ten seeds to a hill and cover two or three inches. Scattering a few radish seeds over the surface and covering lightly will often attract the first crop of insect pest when they may be destroyed and lessened to just that extent. When the plants show their third leaf, thin to the three strongest plants. Keep the soil mellow by frequent plowings and cultivations. If cut-worms put in an appearance try baiting them as recommended in the April issue. Look frequently and carefully under the leaves for aphids, and if present pinch off the worst infested leaves and spray the remainder of the plant with soap solution, a tobacco decoction or kerosene emulsion. Unless this pest is controlled in time the crop had better be plowed under. Pinch back the runners as they begin to mingle with neighboring plants, and pick all fruits that may become stung by the melon-fly. These should be buried or burned. Where only a few plants are grown for home use, it will be worth while to protect the vines with light frames covered with thin mosquito-bar. No other effective preventative is known to the writer.

The principal variety grown in Hawaii and shipped to the Honolulu market is the old standard Kolb's Gem, a well-known market melon, bearing transportation well, but of poor

flavor. Other standard sorts, of superior flavor and sweetness, are Cuban Queen, Kleckley Sweet, Selected Lodi, a popular California variety; Mammoth Ironclad, Fordhook Early and Dixie. Colorado Preserving is the leading variety for making citron preserves.

During the past month and up to the present writing the following list of vegetables were harvested from Kamehameha Farm: Beans, Kam. selected dwarf golden wax; Lima beans, Burpee's Quarter Century (which has proved to be the best variety of large lima we have ever grown and is recommended for trial). Henderson's bush lima (is smaller and less tender, but very prolific), Beets, Cox's Imp. Blood-turnip, Egyptian and Eclipse (the former leading in quality and size). Cabbages have failed to head with us during the dry



fall months, but young plants just set out promise well. Carrots, Damon's Half long orange, Early Scarlet Horn and Chantany, have done well; Cauliflower, as with cabbage, have been a failure. Celery is backward; Collards, Carolina Blue stem, has done fairly well; Sweet Corn, Early Mammoth Sugar, has cropped heavily, though the stalks were not so long as usual. A new lot just coming into ear was much benefited by the recent rains and should attain full height and quality.

Cucumbers have not done well, the fly has been unusually destructive. Egg plants have done well, Black Beauty being the only variety now grown. Lettuce, Deacon, Hanson, The Morse and Calif. Cream Butter, always do well with us and the present season is no exception. Okra is just coming into

bloom and should supply fruit by Christmas. Onions, green, for table use, are an important vegetable for our boys and we have six, sixty-foot beds planted to sets to supply school needs. Planted August 15th these beds, four by sixty feet,



have averaged us \$6.50 per bed, bunches of thirty-five onions being sold at 5 cents each. Parsley is a perennial crop and permits of by-monthly cutting, the extra dwarf curled varieties make handsome pot plants and may be made to serve for ornament as well as culinary purposes; no kitchen ought

to be without a potted plant. Radishes have done well as usual, and Cox's Rose Queen still heads the list in our trials.

Of the acre of squash planted in September for Thanksgiving trade a little less than a thousand pounds sound fruits were harvested on November 25th. This yield is less than half what we expected. Dry weather and the melon-fly are principally responsible. Summer Crook Neck, Scalloped, Gold o' Heart and Hubbard were grown; the latter proved the most resistant to the fly. A fourth acre of tomatoes are just beginning to show ripening fruits. The following varieties are represented: Ponderosa, New Stone, Acme, Honor Bright, Spark's "Earliana," Livingston's Beauty and Royal Red. Specimens of Ponderosa have been measured and weighed with the following readings: circumference, 17 inches; weight, 31 ounces. The crop promises the best we have ever had notwithstanding injury by the fly.

Under "Garden Notes for August" was reported an extensive planting of fodder beets for comparative test of varieties under local conditions. Seeds of the following varieties were sown August 10th: Mangel Wurzel Long Red, Yellow Intermediate and Golden Tankard. We began harvesting the roots of all three varieties on November 15th, sixty-six days after sowing the seed, and at this writing, November 30th, the whole crop is practically ready to be harvested. The pictures herewith represent a partial view of the field on November 15th, and the selected specimens in the wheel-barrow the best average roots on November 20th. Figure 1 shows 5 specimens of Golden Tankard weighing 37 pounds, an average of about $7\frac{1}{2}$ pounds. Fig. 2 shows 5 specimens of Yellow Intermediate weighing $39\frac{1}{2}$ pounds, almost 8 pounds to the root. Figure 3 shows 4 specimens of the Long Red Mangel Wurzel, weighing 44 pounds, an average of 11 pounds each. A rough estimate, averaging the crop right through, places the yield at from 25 to 50 tons per acre. The Long Red Mangel is much the heaviest cropper, yielding nearly a third more in weight. On the other hand the feeding value of the other two varieties is considerably higher.

The roots are being fed to the school dairy herd of twenty cows, all of whom seem to relish this substitute of part their fodder ration. Ten pounds chopped roots are being fed per cow daily, but the experiment has not yet been sufficiently

long under way to determine their value as a milk producer. California dairymen value the roots highly, and report yields of from 50 to 80 tons per acre under favorable conditions.

The crop is recommended for trial to all who are favorably situated. Even if the feeding value is no greater than present crops, all practical feeders will appreciate the value of a variety for dairy cows especially.

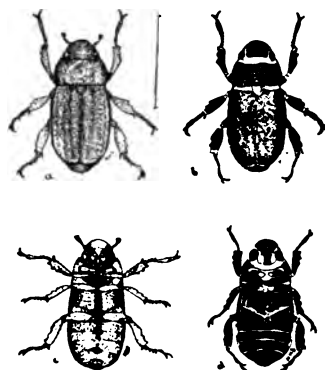
(This series of garden notes is to be concluded in the December issue.)

ENTOMOLOGICAL NOTES.

From the Division of Entomology, Board of Agriculture and Forestry.

BY JACOB KOTINSKY.

THE JAPANESE BEETLE FUNGUS.



Japanese beetle (*Adoretus um-brosus*, var. *tenuimaculatus*)

a, upper side of living beetle.

c, under side of same.

b, upper side of beetle killed by fungus.

d, under side of same.

Perhaps no one upon these Islands has had more extensive experience with the propagation and distribution of this useful fungus than Bro. Matthias Newell of Hilo. With the assistance of the pupils attending his classes he has been able to inoculate and distribute tens of thousands of diseased beetles through Hilo and vicinity, besides a good many that went to other localities and other Islands. He asserts with authority that the fungus has been distributed to all portions of the group. His efforts in and about Hilo have been rewarded with success which to the writer's mind is due, first, to Bro. Newell's perseverance; and secondly, to the very favorable climatic conditions, namely,

the abundance of rain in Hilo. Similar success under similar conditions has been attained in other districts of the Islands. In the arid districts, however, the fungus has not been as effective

as would be desirable. This is readily accounted for by the want of ample moisture without which the disease, or more correctly, the fungous parasite cannot thrive.

As yet our knowledge of this fungus is limited. Like all fungi it is a plant of a very low order which grows in threads (*Mycelia*) composed of elongate cells attached end to end, with occasional lateral mycelia of similar structure. After a certain period of growth some of the mycelia upon reaching favorable conditions, such as air in some, fructify. This fructification consists of the formation of a large number of minute sacks packed full of still smaller granules called spores. The spores in a way correspond to the seeds of higher plants. They are very light and extremely small, microscopical, so that when released from the enclosing sack they are blown about by the wind or transported from place to place by insects, birds and similar agencies. After lodging, favorable conditions, usually moisture and warmth, cause the spores to germinate and resume growth in form of mycelia. For nourishment fungi depend either upon living plants and animals or upon decaying vegetable and animal products. In the former instance they are classed as parasites and are regarded injurious or beneficial, depending upon whether they attack plants or animals useful to man or injurious to his interests. Thus the fungus diseases that attack our mangoes or coffee, for example, are injurious, while those destroying Syphanta or Japanese Beetles, are beneficial.

Just where spores must lodge upon the Japanese Beetle in order to inoculate it is not yet definitely ascertained. We must assume that the germinating spores enter the body of the beetle either through the mouth or the spiracles, or pores, by means of which the insect breathes, one of which is generally located on each side of each ring of the insect body. In a message recently received from Dr. N. A. Cobb, Plant Pathologist of the Hawaiian Sugar Planters' Association Experiment Station, who generously devotes some of his leisure moments to examine fungus material for us, he states that while he found mycelia within the general body cavity of the insect, no traces of the fungus were observed, although looked for, in the alimentary canal. This would seem to indicate that the Japanese Beetle is not infected by means of its food. The fact is that, wherever the fungus enters the insect body, it propagates and grows within the body cavity until it fills it completely. This

mass within looks not unlike cheese with normal butter color. The insect at that stage looks unusually clean and polished brown. When the mycelia have filled the body cavity they force their way through the thinner portions of the body wall, usually the spaces between the segments or rings or joints and appear as a very white cottony substance. The beetle itself is usually dead long before this appearance. In from twenty-four to seventy-two hours the sporangia, or fruiting sacks, are produced. The mass then looks grayish green and is of a somewhat powdery consistency.

In course of the past several years the people of these Islands have acquired the habit of reposing considerable confidence in the effectiveness of this fungus to check the ravages of the Japanese Beetle. In point of fact, if the necessary conditions for its propagation are supplied, either naturally or artificially, some degree of success is inevitable. Fortunately the beetle shows preference for plants about door yards, where favorable conditions for the propagation of the fungus can be created with comparatively little effort. I therefore take pleasure in inserting below the instructions from the most expert authority on the subject on

HOW TO INOCULATE JAPANESE BEETLES.

(*Adoretus umbrosus*, var *tenuimaculatus*.)

BY B. M. NEWELL.

Take a box about six inches deep, and fill about one half with damp soil. Keep this soil moist, not muddy, by occasionally sprinkling with water. Dry soil will not work. Collect a lot of beetles and place them in this box. Be sure to feed the beetles for they must not starve. The best time to place the food in the box is during the day, because then the beetles are mostly hidden in the ground. If the box be opened in the evening they will try to escape.

Valuable plants need not be taxed for their food, for any one may have noticed that even certain weeds are eaten by them. The so-called "honohono" grass is found in many places and beetles eat it readily.

Keep the lid of the box well down. No special precaution need be taken about air holes. Keep the box in a dry, shady place.

Beetles placed in such a box and properly cared for will die of the fungus, for the fungus which destroys them is now found in all localities.

A whitish substance grows out of the joints of the dead beetles, which after a few days turns green. The substance is the fungus. When a number of beetles have developed the green fungus, mix them well with some dry or nearly dry earth or fine sand, and scatter this mixture over and around the plants attacked.

REPORT OF MR. ALVIN SEALE OF THE UNITED STATES FISH COMMISSION, ON THE INTRODUCTION OF TOP-MINNOWS TO HAWAII FROM GALVESTON, TEXAS.

Honolulu, Hawaii, September 23, 1905.

Mr. D. L. Van Dine,

Entomologist, U. S. Experiment Station,
Honolulu, H. T.

Dear Sir:—In accordance with the following letter to yourself from Dr. David Starr Jordan, I was chosen to attempt the introduction of "top-minnows" or "killifish" into the Hawaiian Islands for the purpose of destroying the larvae of mosquitoes:

LELAND STANFORD JUNIOR UNIVERSITY.

Office of the President.

Stanford University, Cal., April 18, 1905.

Mr. D. L. Van Dine,

United States Experiment Station,
Honolulu, Hawaii.

Dear Sir:—The best place to collect the fishes which you want would doubtless be in Louisiana. It would probably take no longer time to bring them from there than from any other places nearer. Perhaps an equally good place would be Tampico, on the edge of Mexico. You understand that this would necessarily be an experiment. These little fishes feed freely on mosquitoes. Some live in brackish water, some in fresh water, and all of them are very hardy. But no one has ever tried to transplant any of them, and the whole thing might turn out, for some reason or other, to be a failure. Especially one would need to experiment on feeding the little fishes during their transportation. The genera which I would recommend are *Mollienesia*, *Adinia*, *Gambusia*, and *Fundulus*. Some of these are viviparous, others lay eggs. Whoever undertakes this should give a good deal of attention to the question of feeding the little

fishes, and for this purpose perhaps a tank breeding mosquitoes would be as good as anything. The best time to undertake it would be about the 1st of June. I will select some one as soon as I hear from you.

Very truly yours,

(Signed)

DAVID S. JORDAN.

On receipt of yours of July 11, 1905, with the advance of \$500 of the Territorial appropriation covering the expenses of this undertaking, I started from Stanford University to the Southern United States. It was my intention to secure the top-minnows at or near New Orleans, but the rigid quarantine in operation in Louisiana prevented my carrying out this plan. Seabrook, near Galveston, Texas, was then selected as the next place most available. At Seabrook I found the family of top-minnows, *Poeciliidae*, in large numbers. They were swarming in all the stagnant waters at sea-level as well as in various ditches, ponds, and standing pools. Mosquitoes are very plentiful in and about Seabrook but after a study of the situation I am convinced that their source is not the bodies of water containing these fish but rather temporary and artificial breeding places, such as closed pools, tubs, tin cans, and other refuse which are not accessible to these fish.

As per his letter to you, Dr. Jordan recommended the following genera; *Mollienesia*, *Adinia*, *Gambusia* and *Fundulus*. These are all members of the single family *Poeciliidae* or top-minnows. I first made a careful examination of a number of the stomachs freshly taken from members of the above genera. The stomach-contents was found to consist largely of larvae of various insects, including those of mosquitoes; egg-masses of mosquitoes; minute crustaceæ and some vegetation. The results showed that *Gambusia* were the best insect feeders. Of 100 stomachs of this genus examined all contained many insect larvae and eggs among which I noticed especially numerous egg-masses of the mosquito. However, *Mollienesia*, *Fundulus* and *Gambusia* differed slightly in regard to their capacity for the various insect larvae and the difference was probably due to the different food localities. The temperature of the water in and about Seabrook in which these fish were found ranged from 74° to 87°.

It now remained to determine under what conditions the fishes could be most successfully transported to Hawaii. Six ordinary ten-gallon milk cans were prepared by puncturing

the covers with numerous holes and placing the cans in bran sacks, the intervening space being tightly packed with Spanish moss. This served to keep the water at an even temperature. Two hundred fish were placed in each can. The following morning so many were dead that it was evident the cans were overcrowded and I reduced the numbers to one hundred.

Experiments were conducted as follows:

Can No. 1. Allowed to stand undisturbed. Water unchanged and unaerated. Temperature normal. The first morning six fish were dead. The second day, two died. The third day the fish were perfectly lively and were taking food freely. The fifth day five died and by the eighth twenty had died. The experiment was not carried further.

Can No. 2. Water changed once each day. Temperature normal (ranged from 74° to 78°). During the first three days there were four deaths. The eighth day two died. After this time there were no more deaths. Fish fed freely on mosquito larvae, and prepared fish food.

Can No. 3. Water changed twice each day. Temperature normal. Three deaths the first night. After this time there were no more deaths. Fish fed freely on mosquito larvae and prepared fish food.

Can No. 4. Water changed every two days. Temperature normal. Five deaths the first three days, after which no fish died. Fish fed freely, keeping constantly at top of the water.

Can No. 5. Water slowly and very gradually reduced in temperature to 40°. Fish would not feed at the end of six days. During this time eighteen had died. Experiment discontinued.

Can No. 6. Water reduced slowly to freezing point, then can packed in ice. At the end of six days all but three of the fish were dead. Experiment discontinued.

The above experiments demonstrated that the fish should be transported in water at the normal temperature and gave the necessary information in regard to the frequency of changing the water.

The three most abundant species, *Gambusia affinis*, *Fundulus grandis* and *Mollienesia latipinna*, were collected and approximately seventy-five placed in each can. On Sept. 4, 1905, I left Seabrook, Texas, on the long journey to Honolulu. A 20-gallon tin tank was taken along as a supply reservoir.

The following routine work was observed during the entire trip: At 8 a. m. the fishes were fed sparingly on prepared fish food, finely ground liver or hard boiled eggs; at 9:30 half the water in each can was siphoned off from the bottom, thus cleaning out the cans and removing all uneaten food and excrement, and an equal amount of fresh water added; at noon the cans were all aerated by means of a large bicycle-pump, a sponge being tied over the end of the hose to separate the air into fine particles; at 4 p. m. two gallons of water was siphoned off from the bottom and two gallons of fresh water were put in; just before retiring the cans were again aerated by means of the air-pump.

At each place en route where the water was changed it was first tested by placing two fish in a bucket containing the new water at the proper temperature. At El Paso, Texas, only, did the water kill the fish thus treated. After ten minutes the two fish were dead, probably due to the alkali it contained. The water at Los Angeles was good as also the San Francisco water, which was used from the latter place to Honolulu, an abundant supply being carried on the steamer. The water used from El Paso to Los Angeles was taken from the supply tank, filled at San Antonio, Texas.

Twelve fish died between Galveston and San Francisco and only fifteen between San Francisco and Honolulu. The fish were landed in Honolulu from the S. S. "Alameda" on September 15, 1905, the trip from Texas occupying 12 days and 27 of the approximate 450 fish were lost.

The fish were in fine condition on arrival and as prearranged by yourself were placed in the breeding ponds prepared for them. The temperature of the water about Honolulu is almost identical with that where the fish were collected, and the appearance of the fish at this writing indicates that they should thrive in the Islands. The fish should be confined in the present breeding ponds, where they can be prevented from going out to sea or falling prey to other fish until their increased numbers permit general distribution to other localities in the group.

Very truly yours,

(Signed) ALVIN SEALE,
Assistant, U. S. Fish Commission.

BY AUTHORITY.

Notice is hereby given that the following gentlemen have been appointed District Fire Wardens, under the Board of Agriculture and Forestry, in accordance with the terms of Act 71 of the Session Laws of 1905:

LIST OF DISTRICT FIRE WARDENS, BY ISLANDS.

KAUAI.

FRANK SCOTT.

In and for the District of Koolau, excepting the land of Anahola.

GEORGE H. FAIRCHILD.

In and for that portion of the Districts of Koolau and Puna, extending from the land of Anahola to the land of Olohena, inclusive.

F. WEBER.

In and for the portion of the District of Puna, south of and including the land of Wailua.

REV. J. M. LYDGATE.

In and for that portion of the District of Kona, formerly known as the District of Koloa.

FRANCIS GAY.

In and for that portion of the District of Kona, formerly known as the District of Waimea.

OAHU.

ANDREW ADAMS.

In and for the District of Koolauloa.

FRANK PAHIA.

In and for that portion of the District of Koolaupoko, extending from the Koolauloa District line to the land of Heeia.

C. BOLTE.

In and for that portion of the District of Koolaupoko, extending from and including Heeia to the land of Kailua.

JOHN HERD.

In and for that portion of the District of Koolaupoko, extending from and including the land of Kailua to Makapuu Point.

WALTER F. DILLINGHAM.

In and for the Districts of Ewa and Waianae.

A. M. NOWELL.

In and for the District of Waialua.

BYRON O. CLARK.

For that portion of the Lands of Wahiawa and Waianae-uka, lying to the east of the main Government road from Ewa to Waialua.

MOLOKAI.

G. C. MUNRO.

In and for the Island of Molokai.

LANAI.

CHARLES GAY.

In and for the Island of Lanai.

MAUI.

LOUIS BARKHAUSEN.

In and for the District of Lahaina.

C. B. WELLS.

In and for the District of Wailuku.

R. C. SEARLE.

In and for the District of Kaanapali.

H. P. BALDWIN.

Fire Warden At Large, for the Island of Maui.

L. VON TEMPSKY.

In and for the Districts of Kula and Kaupo.

J. H. RAYMOND, M. D.

In and for the Districts of Honuaula and Kahikinui.

H. A. BALDWIN.

For the District of Hamakuapoko and the west half of the District of Hamakualoa.

W. F. POGUE.

In and for the District of Koolau and the east half of the District of Hamakualoa.

HAWAII.**F. W. CARTER.**

In and for the south half of the District of Kohala.

D. FORBES.

In and for the western part of the District of Hamakua, extending to the boundary of the land of Paauhau.

JAMES GIBB.

For that portion of the District of Hamakua, extending from the western boundary of the land of Paauhau to the boundary of the land of Kukaiau.

ALBERT HORNER.

In and for that portion of the District of Hamakua, extending from and including the land of Kukaiau to the Hilo District Line.

JOHN M. ROSS.

In and for that portion of the District of Hilo, extending from the land of Makahanaloa to the Hamakua District Line.

JOHN A. SCOTT.

In and for that portion of the District of Hilo, extending from the Puna District Line to and including the land of Kikala.

JOHN WATT.

In and for the District of Puna.

JULIAN MONSARRAT.

In and for that portion of the District of Kau, extending from the Puna District Line to and including the land of Punaluu.

CARL WOLTERS.

In and for that portion of the District of Kau, extending from the land of Punaluu to the Kona District Line.

ERIC H. EDWARDS.

In and for that portion of the District of Kona, extending from the Kau District Line to and including the land of Kaapuna.

GEORGE W. McDOUGALL.

In and for the portion of the District of Kona, extending from the land of Kaapuna to and including the land of Hookena.

JOHN D. PARIS.

In and for that portion of the District of Kona, extending from the land of Hookena to and including the land of Kaawaloa.

T. C. WHITE.

In and for that portion of the District of Kona, extending from the land of Kaawaloa to the land of Kahaluu.

JOHN MAGUIRE.

In and for that portion of the District of Kona, extending from the land of Kahaluu to the Kohala District Line.

Notice is also given of the following appointments:

DISTRICT FORESTERS.

FRANK SCOTT.

In and for the District of Koolau, Island of Kauai, excepting the land of Anahola.

JOHN M. ROSS.

In and for that portion of the District of Hilo, Island of Hawaii, extending from the District of Hamakua to the land of Makahanaloa.

ERIC H. EDWARDS.

In and for that portion of the District of South Kona, Island of Hawaii, extending from the District of Kau to the land of Kaohe.

GEORGE W. McDOUGALL, Co-District Forester, with W. R. CASTLE.

In and for that portion of the District of South Kona, Island of Hawaii, extending from North Kona to and including the land of Kaohe.

VETERINARIAN.

Dr. W. F. EGAN has been appointed Assistant Veterinary Inspector for the port of San Francisco.

Importers of live stock can make arrangements with Dr. Egan to inspect animals to be imported into the Territory.

Address Dr. W. F. Egan, 1115-1117 Golden Gate Avenue, San Francisco, Cal.

C. S. HOLLOWAY,

Secretary, Board of Agriculture & Forestry.

Honolulu, November 22, 1905.

THE LATE DAVID DOUGLAS.

The Forester has been requested to publish the following correspondence which lately appeared in *The Pacific Commercial Advertiser*, relative to the death of David Douglas:

Editor Advertiser: Enclosed in a letter recently received from a friend on Hawaii was the accompanying clipping relative to Mr. David Douglas, the scientific traveler and explorer who met his death on the side of Mauna Kea about eight miles above Laupahoehoe, many years ago:

"A tree whose name is at once the memorial both of a man and a tragedy is the Douglas pine, famous for its magnificent cones. Now, David Douglas was originally a Scotch lad who came under the notice of Sir William Hooker, the well-known botanist, and through his influence was appointed collector of rare plants to the Horticultural Society. He traveled for the society in all parts of the world and was extraordinarily successful in his finds. It was he who discovered lupines, eschholtzias and godetias as well as many magnificent varieties of pine trees, including the one bearing his name. But when quite a young man he met a tragic fate while plant hunting. He was in the Sandwich isles, and there the natives dig deep pits to catch wild animals, coving them over with branches and grass to conceal their openings. Into one of these treacherous pits Douglas walked one day when alone and was at once precipitated to the bottom. No help was at hand."

The writer of the letter suggested that if I could add what is remembered of his tragic death it might make an interesting newspaper article. The story as nearly as I can recall it was as follows:

Mr. Douglas, alone and on foot, on his way from Waimea to Hilo, stopped overnight at the house of an escaped Botany Bay convict who lived in a lonely place on the side of the mountain. The next morning this man warned him to be careful to avoid falling into one of the numerous cattle pits in the locality, which were dug by the natives (and covered with branches, grass and earth) for the purpose of capturing wild cattle.

Ostensibly to insure Mr. Douglas' safety as far as possible, the man accompanied him for some distance on his journey. The next day this man went to one of the pits of which he knew to see if any cattle had fallen into it and discovered therein a

wild bull and the dead body of Mr. Douglas, which the bull had gored. It will never be known which was in the pit first, Mr. Douglas or the bull, nor will it ever be known positively whether his death was caused by the wounds inflicted by the bull or whether he was murdered for the sake of robbery and then thrown into the pit.

There were at the time strong suspicions of foul play. In the first place, Mr. Douglas' bundle was found at a considerable distance further along on the road to Hilo, indicating that he had passed the pit safely and proceeded thus far on his way when for some unexplained reason he had either returned or been taken back to the place where his body was found. And it did not seem at all likely that he would, of his own record, have dropped his bundle on the road and deliberately gone back to this spot.

In the second place, Mr. Douglas was known to have carried quite a sum in gold on his person and when shortly after his death it became apparent that the previously mentioned escaped convict was well supplied with gold coins (some versions say Spanish doubloons), which he took no pains to conceal, it was surmised that this man had murdered the traveler, robbed him and thrown his body into the cattle pit where he afterwards pretended to have found it. The deed may have been committed when the convict escorted Mr. Douglas on the first part of the trip after leaving his house, or he may have waylaid him later and killed him. It is possible also that the victim may have been thrown into the pit alive for the bull to kill, and in either case the convict may not have taken the money until after Mr. Douglas' death. An old resident of Waimea, now deceased, who formerly believed in the guilt of this man, used to say that he died crazy from the effects of this wicked deed preying on his mind.

Some of the people in Hamakua had the body of Mr. Douglas taken to Hilo, from whence it was sent to Honolulu and buried in the west corner of Kawaiahao churchyard (corner of Queen and Punchbowl streets). There the remains still lie in an unmarked grave, but on the corner of the church there is (or was) a tablet to his memory.

The "Hawaiian Spectator," Vol. II., No. 2, for April, 1838, contains a very interesting description by Mr. Douglas of his ascent of Mauna Loa and the summit crater of Mokuaweoweo,

together with an extract from a letter to a lady friend, briefly mentioning his ascent of Mauna Kea.

KAMAAINA.

Honolulu, Nov. 11, 1905.

Editor Advertiser: In this morning's paper (November 20), I read with great interest a letter on the "Death of David Douglass, the Scientist, on Hawaii."

As a child of five years, the death of this stranger, and the fact of his remains being brought to Honolulu for interment, is indelibly fixed in memory; and although the children were not taken to the interment, I would call in question the place mentioned as in an "unmarked grave."

In the little mission graveyard, that hallowed God's acre, can be found to this day a very massive, old-fashioned gavestone, of rough unpolished Scotch granite, to the memory of David Douglas ("which was sent out here by his mother," as we were always told). The marble tablet inserted in the Kawaiahao church was sent many years later by some scientific society, and it having a Latin inscription it was deemed wiser to put it in a public place.

Will you kindly prove this and have the inscription, worn with age, studied out?

ANOTHER KAMAAINA.

Honolulu, Nov. 20, 1905.

Editor Advertiser: With reference to the burial place of David Douglas, the scientist, and the question as to whether his grave is marked or not, I most cheerfully accept the correction of "Another Kamaaina." What appeared on this particular part of the subject in my previous communication was based partly on the statement made in 1841 by Mr. Edmund Rogers (long since deceased), the printer for the American Mission, and partly from similar statements made by others in subsequent years. The explanation of the seeming discrepancy between these statements and those of "Another Kamaaina," is probably that at some time after the original interment in the west corner of the general cemetery the remains were removed to the Mission Plot where they now lie, and so long a time may have elapsed before the arrival of the stone as to give the impression that the grave was unmarked, as the writer certainly believed it still to be, never having heard anything to the contrary until the present time.

In those early days news traveled slowly and it may have been a whole year before Mr. Douglas' mother in Scotland heard of her son's death and possibly several more before the stone she sent reached Honolulu.

Having always taken a great interest in the story of Mr. Douglas and his tragic death and having always regretted that his grave was, as I supposed, unmarked, I am sincerely glad to learn that this was a mistake and that his grave really is marked with a suitable stone erected to his memory.

KAMAAINA.

Honolulu, Nov. 23, 1905.

The marble tablet at the southwest corner of Kawaiahao church bears the following inscription:

Hic jacet
D. DAVID DOUGLAS,
Scotia. anno 1799. natus:
qui,
indefessus viator,
a Londinensi Regia Societate
Horticulturali missus,
in Havaii saltibus,
die 12a Julii A. D. 1834:
victima scientiae,
interiit.

Sunt lacrymae rerum, et mentem mortalia tangunt.
Virg.

MONTHLY LIST OF PUBLICATIONS.

U. S. Department of Agriculture. Studies on Peaches. 1. Compiled Analyses of Peaches. 2. Changes in Chemical Composition of the Peach During Growth and Ripening. 3. Effect of Storage on the Composition of Peaches. By W. D. Bigelow, Chief, Division of Foods, and H. C. Gore, Assistant Chemist. Pp. 32. (Bulletin No. 97, Bureau of Chemistry.)

Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 5 cents.

Experiment Station Work XXXI. Compiled from the publications of the agricultural experiment stations. Prepared in

the Office of Experiment Stations. Pp. 32, figs. 5. (**Farmers' Bulletin No. 233.**)

Contents: Root system of plants—Fertilizers for asparagus—Mushroom culture—Onions in the Southwest—Ether forcing of rhubarb—Noodles—Condimental feeds—Beef vs. dairy type for beef production—Feeding skim milk calves—Animal food for ducks—Milk from diseased cows—Cider vinegar.

Obtainable from the Secretary of Agriculture, Washington, D. C. Free.

Report and Year-Book of the Experiment Station Committee of the Hawaiian Sugar Planters' Association for the Year ending September 30, 1905. Containing the Reports of the Directors, and the Bulletins of the Divisions of Agriculture and Chemistry, of Entomology, and of Pathology and Physiology.

Hevea Brasiliensis or Para Rubber, Its Botany Cultivation, Chemistry and Diseases, by Herbert Wright, A.R.C.S., F.L.S., Controller, Government Station, Peradeniza, Ceylon. Published by A. M. & J. Ferguson, Colombo, Ceylon. Price 7 shillings. Post free to Hawaii, \$1.80.

The following is a brief synopsis of the subjects dealt with: History of Para Rubber, Conditions in Para, Cultivation, Soils and Manuring, Tapping, Yield, Physical and Chemical Properties of Latex, Production of Rubber from Latex, Drying, Physical and Chemical Properties of Rubber, Purification, Vulcanization, Kinds of Para Rubber, and Diseases of Para Rubber Trees. About 20 illustrations are given showing the various conditions under which Para Rubber is cultivated, the methods of tapping, the processes of coagulation, and the instruments and machinery employed.

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DECEMBER, 1905.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. II.

DECEMBER, 1905

No. 12

THE MENACE OF INSECT PESTS TO AGRICULTURE.

Probably the most vital problem facing agriculture the world over today, is the discovery of efficient means to combat the ever growing host of insect pests with which our industries are threatened. Important as may be the extension and development of established agricultural pursuits, desirable as may be the scientific improvements of old species of our domestic plants and the evolution of improved types, yet across the path of progress lies an ominous insect horde threatening to render inefficient, or even to ruin, the labors of agriculturist and scientific investigator alike.

Not only can there be no assurance of the future stability of the world's agriculture before effective preventatives of the evil can be put into force, but it seems reasonable to believe that the enormous increase of cultivated areas during the last few decades has been very generally responsible for the condition of affairs with which our entomologists are now grappling. This is particularly true in the case of the cotton industry, the wonderful development of which has only been commensurate with the appearance of destructive insect agencies, and in our own islands, the sugar and coffee industries bear witness to the same fact.

The indiscriminate exchange of plants and seeds between agriculturists of nearly every country has too often resulted in the interchange of insect and fungoid pests, which in the absence of their so-called "natural enemies," in the land of their adoption, have been allowed to flourish unmolested. The work of the scientific investigator has also in the past contributed to the danger by artificially producing improved varieties of plants, which have often been evolved at the expense of their insect resistant powers.

Throughout the world the enormous ravages of insect and fungoid pests is claiming the attention of individuals, of communities, and of governments. So great has been the destruction

to crops that without the operation of the measures already successfully enforced, and allowing the foolish course of pusillanimity and inaction occasionally met with, to be generally followed, it is reasonable to predict that not one of the great agricultural industries, upon which the population of the world is depended for its food supply, would in a few years be in a position to supply the demands of the race. The problem, therefore, which confronts us is an urgent one, not affecting the success only of those actively engaged in agriculture, or even the prosperity of particular communities, but one threatening the welfare of mankind.

According to a recent publication of the Agricultural Department at Washington, the direct and indirect annual losses to the United States, attributable to insects, amount to the enormous sum of \$700,000,000 dollars. If to this be added the destruction to crops from the same cause throughout the world, the annual loss to mankind from the ravages of insects must, at a moderate estimate, approximate the colossal sum of from five to ten billion dollars. Any well directed attempt to diminish these truly appalling figures deserves earnest encouragement and support.

Fortunately, we in Hawaii, are not only alive to the danger menacing our prosperity, but are in the van of those adopting scientific measures to ameliorate the evil. In our Board of Agriculture and its assistants and associates, we have a body of men at once resourceful in difficulty, indefatigable in the discharge of duty, and renowned for their practical and scientific attainments. Situated in mid-Pacific, at the crossing of the great ocean lines of traffic, this Territory is peculiarly at the mercy of the introduction of exotic pests. Recognizing this, the Board of Agriculture has instituted measures to safeguard our industries and has already achieved a noteworthy success. It seems, however, impossible to adequately protect our best interests in this respect, so long as these Islands have many ports of entry for foreign produce. While this obtains, the efforts at efficient quarantine must to a great extent be nullified, and we hope that Honolulu will in time be made the sole port of entry of the Territory for plants and fruits, and also that legislation will compel the fumigation of everything included in the above category, even when apparently free from insect or fungous pest.

It is not the object of this article, however, to describe the work of our own Board of Agriculture in their quarantine work,

for that is well known, but to adduce examples of what measures are being adopted in other countries for this same end. It will be seen, from the data given later, that not only are the difficulties to be encountered here met with elsewhere, but also that the practices of our Board are followed and endorsed by those countries which are foremost in successfully coping with the question. In many cases the success which has attended our efforts has been closely noted, and our methods have been adopted by other Boards. It is especially gratifying to learn, from the perusal of the agricultural papers of other countries, that we are not only abreast of what is being achieved elsewhere, but are in some cases the pioneers in successful methods. It is to be hoped that before long concerted action will be taken among the civilized nations to endeavor to control the ravages of noxious insects and exotic fungoid pests. The time can never be anticipated when the work of the economic entomologist will be at an end, for the fight will ever be incessant and many "new" enemies will, in the mutation of circumstances, be brought into prominence; but as knowledge and experience accumulates, and the best remedies are discovered, the actual danger to be feared will continually tend to grow less.

Before examining what efforts are being made in tropical and semi-tropical countries, it is instructive to notice what Germany is doing to combat the spread of plant diseases. So important is the question acknowledged in that land of practical and scientific learning, that the Department of Plant Diseases of the German Agricultural Society has recently been elevated to the dignity of an Imperial Institute. Recognizing the importance of the scientific investigation of insect and fungoid diseases to agriculture, through the efforts of Professor Kuhn, of Halle, the German Agricultural Society in 1889 founded a special Department of Plant Diseases, to cope with this phase of agriculture. In two years, twenty-one local stations were established throughout the Empire, which today have increased to forty.

Since the elevation of the Department of Plant Diseases into an Imperial Institution, the various States of the Empire have promised co-operation with the Home Office. A central institute will be established in each state, having dependent stations and agricultural schools associated with it. To each station will be locally associated collectors, farmers, gardeners and foresters throughout the Empire.

It will be well when other governments become alive to the importance of this department of agriculture and establish similar institutions to deal with the question.

WHAT IS BEING DONE IN OTHER COUNTRIES TO COMBAT THE EVIL.

WEST AUSTRALIA.

Inspection of Fruit Trees.

A correspondent has written asking for information as to the inspection of fruit trees arriving at Fremantle from the Eastern States.

The letter was handed to the Horticultural and Viticultural Expert, and he replies as follows:

"On arrival at Fremantle or at another recognized port of entry, the consignment must be immediately removed to the disinfection shed. Within 24 hours the consignee or his agent must, in the presence of the local inspector, unpack and prepare the parcel of fruit or plants for inspection.

"If the examination reveals the presence of rooted vines, mussel scale, mining scale, San Jose scale, wax scale, fruit fly, codlin moth, or insects or fungus or other diseases injurious to fruit and plants, and not known to exist in Western Australia, the parcel is seized and destroyed.

"If other diseases exist which are deemed less injurious, the local inspector retains the parcel in quarantine for a period of 14 days, or until it can be determined whether the plants are free from injurious insect pests, when, after inspection and disinfection, they are released.

"Other fruit or plants apparently free from pests are likewise disinfected after inspection, and a certificate issued after the cases or packing material have been disinfected or destroyed, and after the fee for inspection and disinfection has been paid.

After disinfection, consignees or their agents must repack the fruit or plants and remove the same within 24 hours.

"The fees for the inspection and disinfection of 300 to 400 trees amounts to 9s."—*Journal of Agriculture.*

WEST AUSTRALIA.

Insect Pests.

The introduction into this State of the natural enemies of the insect pests marks a great advancement towards the end every grower desires, and by a proper provision for their reception, observation, breeding, and careful distribution, has added largely to the wealth of the State in an unobtrusive manner, and, in the future, the State will, as their numbers increase, increasingly benefit by their introduction. Owing to the small number of economic entomologists who have given the attention and study the proposition demands, it happens that California and Western Australia are in the van in this particular work. Yet, so it is, the Eastern States would benefit more by the introduction of the Codlin Moth Parasite than even California, where our entomologist has recently successfully introduced it; moreover, we should be spared their cry, because, thanks to our vigilant Port Inspectoral Staff and the prompt treatment of escapes by Mr. Tom Hooper, we do not allow them to dump it here.

Beyond doubt, evidenced in many orchards, and borne out by the reports of the Chief Field Inspector, where a proper distribution has been made, nothing could be more satisfactory than the work of the introduced Black Scale Parasites, Predatory Lady Birds, and others.

The loss from the Fruit Fly yearly is appalling. The methods in force for its check, while operating to some extent in one orchard, in the next failing altogether to lessen the loss it occasions; and, in spite of the act, the pest spreads every year, infecting more orchards.

A detailed report is in course of preparation on the work of the introduced beneficial insects generally, and particularly for the past season. It will give the life, history, and methods of work, also a map and list of orchards where our friends are established.

The Insect House contains upwards of 2,000 Fruit Flies reared from the two dozen or so cases of infected fruit sent in, and thousands of the pests are available in every stage of its life, ready for the natural parasite Mr. Compère discovered in Brazil, and which he will bring here by the end of this month. Everything at present seems against the introduction of this parasite, but Mr. Compère has succeeded with others, and it is my firm

opinion he will be successful in the end, when we obtain the necessary paraphernalia.—*Journal of Agriculture.*

JAMAICA.

Scale Insect and Plant Lice.

But for Lady Birds, the orange growers of California, in spite of all the spraying possible, would have been eaten out by two great pests, the San Jose Scale, and the Cottony Cushion Scale, both of which pests were brought with trees imported from other countries. When the scale got the upper hand of all artificial means, and yet did not apparently kill out the trees in the countries where the scales were brought from, the idea was plain that there must be something keeping the scale within bounds in these countries. Search was made in Australia and China, and it was found that varieties of Lady Birds were common there which lived on scale insects. They were as quickly as possible imported into California, soon increased and soon set up a fairer balance of nature by preying upon the San Jose Scale and the Cottony Cushion Scale.

In Jamaica we are troubled—though perhaps not so badly as in other countries—by scale insects and plant lice (Aphides) on our fruit trees. We have some Lady Birds, but so little is known about them, that we have seen them destroyed as nasty little bugs, yet they are valuable friends. The most familiar is a little fellow something like the shape of a medium-sized tick, but scarlet with black spots, seen on mango trees, papaws, etc. Lady Birds are sometimes as small as a pin head, and, if they can fly, move about easily.

It would require a trained entomologist to investigate about the different kinds of Lady Birds and find on what scale insect they prey. We might then be able to make their characteristics widely known and so care for the most useful of them.—*Journal of the Jamaica Agricultural Society.*

BARBADOES.

Fumigating Imported Plants.

In Barbadoes fumigating chambers have been built. The Trade Act has been amended, giving the Governor-in-Executive Committee power to prescribe the conditions under which alone

plants may be imported into the Colony. Rules and regulations have been drafted to be submitted to the Governor-in-Executive Committee, and these will probably soon be in active operation. The position at one time taken up in regard to the necessity for definite action with a view to keeping out undesirable insects was that there was already, in some of these colonies, such an abundance of insect pests that the introduction of a few more could have little or no effect. The folly of holding to such a position will be realized by any one who reads Mr. H. Maxwell-Lefroy's paper in the *West Indian Bulletin* (Vol. III, pp. 140-51) containing "Suggestions for controlling the importation of insect pests." It is shown, first of all, that a large proportion of the insect pests, especially scale insects, known in the West Indies, have been introduced from other parts of the world. Then evidence is given of the danger of insects spreading from one island to another. The interesting table on p. 143 shows how many of the 120 species of scale insects, known to occur in the West Indies, are to be found in each island. Similarly with other pests, it is shown that they are very unequally distributed, and the necessity is urged for confining them within the closest possible limits.

What it is especially desired to impress upon all concerned in this matter is that each island may, at present, be said to rejoice in the absence of certain undesirable insect pests known to occur in other parts of the West Indies. It behoves such islands, therefore, to do all in their power to keep out these insects, which might, if introduced, prove a very serious menace to agriculturists. The probability is that these pests, in new districts, and in the absence of such natural enemies as have, to some extent, kept them in check elsewhere, would find their new surroundings entirely congenial and would therefore increase rapidly, and be liable to do considerable damage.—*The Agricultural News*, July 1st, 1905.

CEYLON.

Necessity for Preventive Measures in Ceylon.

Of first importance amongst preventive measures, I would place quarantine regulations. It is a fact, repeatedly demonstrated, that imported pests are the most serious. An insect may attract little or no attention in its original home, where it is kept

in check by its own natural enemies, a system recognized as "the Balance of Nature." But take it away from its home; place it in a congenial climate with an ample supply of suitable food, and it will multiply without the checks that have prevented its increase in its original habitat. The very fact of extensive damage by any insect may of itself almost be accepted as proof of its foreign origin. Looking through the list of the different scale insects occurring in Ceylon, I find that all the more troublesome species have been previously described from some other country, and are, therefore, presumably imported insects.—E. Ernest Green, Government Entomologist

SOUTH AUSTRALIA.

Inspection of Imports.

The absolute necessity for South Australia taking such steps as will prove effective in preventing the introduction of the fruit fly is appreciated by most fruit-growers, and any suggestion to modify the present system of inspecting all imported fruits at the port of entry would be strongly criticised. The following extracts from an article by Mr. C. P. Lounsbury, the Government Entomologist, Cape Town, has an important bearing on this subject. He says: "There is no need to dwell at length on the importance of fruit flies as pests. * * * In some places, as in parts of Natal, a peach seldom matures without becoming the home of its loathsome maggot." An experienced horticulturist, writing to him after a tour through Algeria, says: "Algeria ought to be a good place for fruit-growing, but the fruit fly makes it impossible to grow any but the earliest varieties, and these only in a few localities." South Australia is, fortunately, free from this destructive pest, and although some people argue that this is due to the fact that the fruit flies will not live under our conditions, fruit-growers generally will prefer to depend for protection on thorough and efficient inspection of all imported fruit.—*Journal of Ag. S. A.*

JAMAICA.

Scale Insects.

The attention of the Board was drawn to the fact that

there was a serious increase of scale insects amongst citrus trees, and the suggestion was made that the lady-bird beetle, which had been introduced by the United States Department of Agriculture, should be introduced here to keep the scale insect in check; it was pointed out by the Director of Public Gardens, however, that the United States Department of Agriculture had not yet sufficient of the beetles, and they had found that lime and sulphur wash was very effective in destroying these pests. The formula for the wash was published in the Bulletin for May, 1904. A suggestion was made that the Board should purchase large tents for loaning out to growers, who wished to fumigate their trees, but the cost involved made its immediate adoption impracticable.—*Annual Rep. Board of Ag., 1905.*

PORTO RICO.

Insect Pests.

The annual report of the Porto Rico Agricultural Experiment Station for 1903-4, recently issued, contains a chapter on insect pests in which the principal insects of the year are briefly reviewed:

"The bud maggot (*Lonchaea chalybea*) of the cassava has continued a serious pest. This is a small fly, the larvae of which live in the terminal buds of the cassava stems. Hand-picking of the infested portions has been found the best remedy, though the application of tobacco dust has at times given good results.

"The coffee leaf-miner has long been known as a serious pest of coffee. It is estimated to cause a loss of \$150,000 to \$300,000 in one year in Porto Rico. Recently, however, this pest has been on the decrease in several districts of the island, due largely to the attack of a small Hymenopterous parasite (*Crrysocharis lividus*) which destroys the larvæ of the leaf-miner. This parasite was first named from a specimen collected in St. Vincent, but its habits were not known until recently. It is hoped that this parasite will continue to increase in numbers and further reduce the damage by the leaf-miner."

SOUTH AUSTRALIA.

Fruit and Orchard Inspection.

During March, the inspectors under the Vine, Fruit, and Vegetable Protection Act at Adelaide admitted 3,272 bushels of fruits and 41 packages of plants. While 12 packages of the latter were detained owing to the absence of the necessary declaration respecting the absence of the phylloxera from their place of origin, 259 bushels of over-ripe bananas were also destroyed. The exports to New South Wales, Queensland, and Victoria consisted of 12,376 bushels of fruits, 16 parcels of plants, and 2,901 packages of vegetables. Of these, 3,264 cases were grapes sent to these States. During the same time 2,931 bushels of apples and pears were certified as fit for oversea export to Europe and elsewhere. This was done by special arrangement with the shippers. During March Mr. Quinn has visited orchards at Mount Crawford, and lectured at Gawler in connection with his work of horticultural instruction. He has also visited orchards at Fulham, Grunthal, and Belair, in quest of suitable fruit to be forwarded to the Brisbane Fruit Show, to represent South Australian productions. Much of his time has, however, been occupied in connection with the inspection of fruit shipped to oversea ports by certain exporters who desire reports upon the condition of their produce at the time of shipment. Between February 28 and March 13, Inspector Kelly has paid 81 visits of inspection to orchards and gardens in the Clare district. This occupied six and a half days' active work. Mr. Kelly reports that the fruit crops are just about harvested, and, with the exception of one or two orchardists, the only persons who do not pay reasonable attention to the suppression of fruit pests are those who

Journal of Agri-

AUGUST 1891.

At Mount Crawford, con-
siderable quantities of fruit are on his posses-
sion. In connection with the matter,
the subject which had

been noticed attacking a fruit fly maggot as it was wriggling its way out of an infested peach lying on the ground. To this maggot the small insect had made fast by means of its mandibles, and a few hours after the maggot was found to be dead and only the dried-up remains were left, while the crawling insect, which had been very active before the attack, lay down in a satisfied state. This predaceous enemy of the fruit fly maggot was taken to the Department of Agriculture for a preliminary examination, and was shown to be the larvæ of a ground beetle. It has since been forwarded for identification to Mr. A. W. Lea, the Tasmanian Government entomologist. In connection with this observation, it is interesting to note that on his return from Brazil last year, Mr. Compere brought with him some very active ground beetles, which in that country are amongst the most ferocious enemies of the fruit fly maggots there.—*Journal of Agriculture W. A.*

WATER BUFFALOES.

The board has endeavored to obtain information as to the suitability of the water buffalo for purposes of draught in swampy districts. They are informed that this buffalo, which is in common use in India and the Philippine Islands, has never been introduced into the United States for working purposes, but that several years ago a number were imported into the Hawaiian Islands on account of their value for work in wet and mud, for the cultivation of the rice fields there. Many years ago a bull and two cows were imported from India into Trinidad. The animals have increased and in one herd there are over forty and in another over one hundred. A bull and two cows were also imported into Jamaica some years ago, they were kept in St. Ann and the bull died. Buffalo bulls can be obtained at Calcutta for about 100 rupees. The last bull landed at Trinidad by an immigration ship cost about £25, but if sent by ordinary cargo steamer, via New York, the cost is about £40. The holders of these animals find them so useful that they do not care to part with them, but it may be possible to purchase a few in Trinidad at reasonable prices.—*Jamaica Annual Report on the Board of Agriculture, 1905.*

AGRICULTURE IN HAWAII.

I have chosen this subject as the title for a paper because agriculture is Hawaii's all-in-all and one may, in discussing it, safely touch upon any phase of the social or political situation, and yet not transgress its bounds. In Hawaii agriculture is synonymous with politics and state policy, private and public business, commerce and the practise of the professions. Every phase of our social life is a part of it, not to be separated from, and absolutely dependent upon it.

Hawaii has always been dependent upon one industry. First it was sandal-wood, then supplying wheat and potatoes to the California gold miners, next the whaling industry, then a short regime of pulu and coffee, and finally sugar. It has been sugar so long and to such profit that we have almost forgotten that a land which has only one industry is weak and vitally vulnerable. Whatever affects our one industry influences the whole social and political fabric. When prices rise or seasons are good we are all prosperous, but a shortage of labor, a plague of pests, over-production of beet-sugar by the German growers, or a phenomenal crop of cane in Louisiana or Java react here in Hawaii so that the very foundations of business are shaken, and we live in fear of what the morrow may bring forth. Agriculture has become a complicated problem, not simply here in Hawaii, but the world over. To-day's price of flour in London is influenced by yesterday's advices in regard to the wheat outlook in Argentine and India or a snow storm in the winter-wheat belt of Kansas.

No country dependent upon other countries for its food supply can ever attain that economic stability requisite to the building up of a self-sufficient commonwealth. No country can stand upon one leg without danger of overthrowal by a very slight displacement of the center of gravity. Agriculture has been variously defined. At first it was the cultivation of the fields or of the soil; modern scientists say it is the cultivation and care of plants to supply man's necessities; but politically agriculture is something more, for man's necessities are not simply bounded by hunger and thirst or the desire to be clothed. The field of agriculture has broadened so that States now consider the means employed in production equally with the quality of the product and its cost.

Rich lands do not of themselves make a rich country, so

that the possession of extensive areas of rich land by a State is of less importance than that the land, whether rich or poor, should be well populated. Land capable of growing large crops may be absolutely valueless because the conditions of government are such that a civilized population cannot exist. Take a map of the world and one can see that there are on every continent millions of acres of tillable lands absolutely untouched,—immense areas almost unpeopled. Nations as well as individuals may be land-poor through the possession of rich and well watered areas. Men are worth more than acres.

Hawaii is an integral part of the United States. Potentially it stands as the western outpost for the defense of the Pacific coast. But until Hawaii is peopled with a citizen population it would cost more to defend than would all the rest of our western coastline. As long as its citizens are few in number Hawaii would be more of a menace than a protection to the mainland in time of war. A large garrison would have to be fed and would require large naval defenses to keep open the lines of communication and prevent the starving out of the defenders. But establish in Hawaii a hundred thousand white farmers and these islands will become actually what they are now, only in a theoretical sense, the western outpost and first line of defense, a country which could not be starved out by simply cutting off or destroying trans-Pacific communication.

It seems to me that we should look conditions squarely in the face. Hawaii is weak because of the poverty of four-fifths of her present population who have absolutely no resources; on an average hardly enough accumulated wealth to tide over a week's enforced idleness. Such utter dependence of a weak race on a strong one does not tend towards economic or political stability. Substitute men who cultivate and live upon their own lands, and while the initial cost of production of raw materials may increase to the detriment of some men's fortunes, the wealth and political health of the whole body politic will become immeasurably greater.

What Hawaii needs most of all is not an abundance of cheap laborers, who, through racial incapacity and stress of daily necessities, lend themselves to the indefinite supremacy of a particular industry or system, but a race of men who have faith in both the present and future of these islands. Men are worth more than acres.

JARED G. SMITH.

A SHORT TRIP TO THE MIDWAY ISLANDS WITH CAPTAIN A. P. NIBLACK IN THE U. S. S. "IROQUOIS."

Honolulu, Oahu, Nov. 5, 1905.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I beg to submit herewith an account of my recent trip to Midway and the islands to the westward; with my observations on the general condition of the vegetation existing there, and my report of what was done in the planting which your Honorable Board authorized me to undertake.

I remain,

Your obedient servant,

GERRIT P. WILDER,
Special Agent, Dept. Agric. & Forestry.

The chain of islands, rocks and shoals, which lies to the westward of the Hawaiian group, and between it and the Midway Islands, includes Nihoa (modu manu) or Bird Island, Neckar, Gardiner's Island, Frost Shoal, Two Brothers' Reef, French Frigate Shoals, Maro and Dowsett's Reef, Laysan Island, Gambia Rock, and Lisiansky Island; all these at different times have been annexed to Hawaii, and in consequence of annexation of Hawaii to the United States, have become the property of that country.

The Midway Islands have always been considered as belonging to the United States.

On September 15th, 1905, the U. S. S. Iroquois steamed out of Honolulu harbor headed for Midway. The next afternoon we passed Nihoa or Bird Island, which lies about 120 miles northwest of Kauai.

This island, which was discovered in 1789 by Captain Douglas of the "Iphigenia," is about three-fourths mile long and one-third mile wide. There are two peaks, the highest of which, on the west end, is 903 feet, the eastern peak has a height of 869 feet. From the center part of the island, which is about 600 feet high, the land slopes gently toward the sea, forming a sort of valley on the southern side, and ending in a small inlet with a stretch of sand beach. This is called Adams Bay, and a landing can be made here in smooth water.

This island is the resort of myriads of birds, which lay and hatch their eggs during certain seasons. The Gannet (*Sula cyanops*) was very numerous at this time we were there in September, and the white breasts of the adult male birds, as they sat perched upon the rocks covering the sunny slopes, gave the island the appearance of grave stones in a huge cemetery.

There were neither streams nor any signs of water; whatever rain might be caught in the hollows of the rocks would be contaminated by the bird deposits, and thereby rendered unfit for use. The island is rocky and quite barren; there are no trees whatever and but a scanty growth of wild grasses, weeds and vines.

The following day we reached Neckar Island; we made no landing here, but steamed slowly past; Captain Niblack blew the "Iroquois's" whistle, while we all watched carefully for signs of human habitation.

Neckar Island was discovered by La Perouse, in 1786, and in 1894 it was formally annexed to Hawaii. The flag pole placed there by Captain James A. King for the Hawaiian government remains today.

This island is of volcanic origin, and according to Captain Hugh Rodman of the U. S. Navy: "Bears unmistakable evidence of having been known and visited by an ancient race. A rough pathway extends the whole length of the highest ridge, the island itself being naturally rugged, uneven, and weatherworn, and at every available spot rectangular platforms have been constructed. One of these platforms or terraces measures 30 by 48 feet. They are mostly paved with pebbles and small stones, and encircled by partly up-ended blocks of lava, and partly by low walls two feet high and three feet thick. A few rough stone idols or images have been found there." There is little soil, and no water, and for vegetation a scanty growth of dwarf shrubs.

We made no stops at either French Frigate Shoals or Maro and Dowsett's Reef, but passed close to Gardiner's Island, an inaccessible rock 170 feet high, which at a distance looked like the top of a snow-covered peak, but upon closer examination proved to be the white guano deposits reflected in the morning sun.

Laysan Island, which we reached at 9 o'clock on Tuesday

morning, September 19th, is a small low island $1\frac{3}{4}$ miles long, one mile wide, surrounded by a narrow fringing reef 100 to 500 yards broad. In the center of the island is a large salt lagoon which has no connection with the sea. We steamed up to the lee side of the island, where we found the steamer "Iwalani" loading guano for Honolulu, and the schooner "Woodbury" with a cargo of merchandise from the same port.

Captain Niblack and I went ashore in the "Iroquois's" boat, and were cordially greeted by Captain Max Schlemmer, king of Laysan. We remained only a few hours, during which time I planted one cocoanut tree, and left 20 sprouted nuts with Captain Schlemmer. Besides a box of ironwood trees (*Casuarina equisetifolia*), some branches of the hau (*Paritium tiliaceum*), and seeds of the milo (*Thespesia Populnea*), kamani (*Chrysophyllum inophyllum*), various grasses, which I had taken care to gather from the windward side of this island, and some lily bulbs which came from the beach at Heeia, Oahu.

There is an abundant growth of vegetation above the surf line, and although during the winter months, heavy northwest gales are frequent, I believe, that with care and attention, a few other varieties of trees would grow there. Cocoanuts should be planted in quantities, and although Laysan Island is 270 miles further north than Honolulu, trees should do well if kept protected from the live stock now upon the island. At the time of my visit I saw two cocoanut trees on Laysan, which were about twelve years old, and these were growing in the lee of Captain Schlemmer's house.

On the border of the salt lagoon grows very abundantly, the rush called makaloa (*Cyperus laevigatus*), the same as that from which the Niihau mats are made. Manienie grass (*Cynodon dactylon*) has been taken there from Honolulu and can be found scattered over the island. The presence of one old donkey and a few milch cows, feeding at large over the island, do not seem to have made any impression on the wild grasses distributed there. A well has been sunk inland; the water of which is used for washing purposes. Drinking water is caught from the sheds and stored in cement cisterns. While there, our sailors amused themselves catching fish, they also shot a few turtles.

The guano deposits, which are rapidly being exhausted,

are worked by the Pacific Guano and Fertilizer Works of Honolulu. While on the island I collected a few bugs, and turned them over to Prof. Perkins, entomologist for the Hawaiian Sugar Planters' Association. Birds were very plentiful, and although it was not the regular breeding season, I saw many young of different varieties squatting under the bushes and in the long grass. The Laysan Island canaries were very tame, as also the wingless birds; the latter, upon the approach of danger, seeks protection by entering the holes made in the sand by the mutton bird (*Puffinus cuneatus*). We left Laysan at 2 p. m. and the next afternoon sighted the Pearl and Hermes reefs, which is an extensive atoll about 40 miles in circumference and 16 miles long, on which are scattered 12 small low sand islets forming a crescent which is open to the northwest.

This atoll was discovered in 1822 by two whalers, the "Pearl" and "Hermes," which were wrecked near the eastern end on the same night, and within ten miles of each other.

Captain Niblack made observations here, and we saw wreckage, and what appeared to be flag poles or masts, but we saw no signs of human beings, and, as it was late in the afternoon we decided not to go ashore and we proceeded on our voyage.

At daybreak the next day, September 21st, we sighted Midway, and at seven o'clock we entered Wells harbor and tied up to the buoy.

The "Iroquois" carried lumber, merchandise and stores for the U. S. Marine Station, also supplies for the cable company.

We spent the better part of the first two days in landing this by means of a lighter and smaller boats.

The crew caught many fish, which, with one or two exceptions, were the same varieties found in our Hawaiian waters.

The Midway Islands lie 420 miles further north than Honolulu. They were discovered in 1859 by Captain Brooks of the Hawaiian bark "Gambia," who took possession of them in the name of the United States.

This group consisting of two large islands called Sand and Eastern, together with two small islets, are encircled by a coral reef, nearly 18 miles in circumference. Sand and Eastern Islands are separated by a passage one-half mile wide, navigable by small boats, only at high water.

Sand sland, upon which is located the U. S. Marine barracks and the station of the Pacific Commercial Cable Company, is $1\frac{3}{4}$ miles long and $\frac{3}{4}$ mile wide, and but 43 feet above the sea level at the highest point.

The sand is almost pure white, of very fine grain and extremely dazzling to the eyes. It shifts continually with the wind, covering and destroying the vegetation, besides leaving the trees and shrubbery exposed to the elements; this probably accounts for the scant and meagre growth there.

The sand dunes, which are scattered over the island, are covered with scrubby bushes; there is no soil whatever. There are a few stunted ironwood trees (*Casuarina equisetifolia*), which have withstood the fury of the gales, and some cocoanut trees, which have been most carefully protected. There is some manienie grass (*Cynodon dactylon*), growing here and there in places, and several kinds of salt grasses. On the sand dunes I found growing one of the scaevolae, lobelia (?). This shrub is very brittle and has a small white flower, which is very fragrant, and it has a local name of magnolia. This plant grows readily from slips. At present the cable company are planting this to form hedges which will prevent the shifting sands from encroaching upon their walks and other property.

With the assistance of Mr. B. F. Colley, the superintendent, I planted a few sprouted cocoanuts, and in the lee of the operator's house put a row of ironwood trees. The cable company has a fine station here, consisting of four commodious, two-story, slate-roofed and fire-proof buildings, which were constructed by Miliken Brothers of New York.

These four buildings form a rectangle, the inside court of which is about 50 by 100 yards. In the center of this court, are large cisterns for conserving the rain water, caught from the roofs of the buildings. At one end of the court is a well, from which the water is raised by means of wind mills, this water is pure and sweet. This well was dug by Captain F. D. Walker in 1888, when he and his family on the ship "Wandering Minstrel" were wrecked there. Portions of this wrecked vessel lie on the beach today; also to be seen are the keel and ribs of the boat which Captain Walker attempted to build, and in which he had expected to leave the island; but they were rescued by the schooner "Norma," and brought to Honolulu after having remained on the island 14 months.

The cable station is in charge of Mr. B. F. Colley, whose wife is the only woman on the island. They occupy one of the four large buildings, and their home is very comfortably fitted up. I was invited to go ashore and remain with them whilst the "Iroquois" was in port, and I spent two very interesting days there. Besides the manager's house, there is one for the office, in which are the cable instruments and machinery, another for the operators, and in the fourth is the general dining-room and kitchen. There is a fine library, also a piano with pianola attachment, the personal gift of Mr. Mackay. In a detached building the servants are housed. All these buildings have modern plumbing in connection with a sewerage system leading into the ocean.

The company have an ice-making plant, and cold storage house where their fresh meats are kept; cattle and sheep are brought on the hoof two or three times a year.

I collected a few insects; one of them a pernicious cut worm, which, as yet has not reached the Territory of Hawaii; of these I left specimens with Prof. Perkins, and also with the Entomological Division of the Department of Agriculture. The island is free of mosquitos, but flies and ants are very numerous. Birds are very plentiful in the season, which begins about the middle of October, at which time great quantities of the albatros migrate here, build their nests on the sand, and raise their young. I noticed heaps of dried bird's skins, feathers and bones, and was informed this was the result of the recent visits of the Japanese bird catchers who had slaughtered them for their wings and feathers.

These men were found by Captain Hugh Rodman of the U. S. S. "Iroquois," and he ordered them to leave the island. Subsequently they were found on Lisiansky and 77 of them were brought to Honolulu on the U. S. S. "Thetis."

The U. S. Marine Station consists of four wooden buildings, in which are housed the Captain and about twenty men. While on shore Captain Niblack made repairs to the beacons and land marks, which had been blown down by the recent hurricane, during which the wind traveled at the rate of 75 miles an hour. He put in operation the new light house which was recently built and placed the light, which is visible 16 miles at sea.

With a boat's crew of Japanese, Mr. Morrison, Assistant Superintendent of the Cable Company, and I, sailed across to

Eastern Island, which is one and one-quarter miles long and one-half mile wide, and only from six to twelve feet above the sea level. The sand here is very coarse, not so shifting as on Sand Island, and the vegetation grows readily. The island is thickly covered with wild grasses and low shrubbery. Here the Cable Company have put a pair of donkeys, and a few sheep; all are fat and apparently seem to enjoy their secluded life there.

Birds of many varieties are plentiful, the Iwa or Mano'war bird (*Aquila frigata*) builds its nest of rough twigs on the tops of the highest shrubs. It lays but one egg. This Iwa is the pirate of the Bird Kingdom, does little or no fishing for himself, but swoops down upon the Bos'n (*Phaethon rubricauda*), and thereby causing such fright to the poor bird, that he disgorges the fish which the Iwa appropriates to his own use. These pirate birds were so numerous and tame, that I had to push them aside as I walked across the island.

The Bos'n bird deposits and hatches its eggs in the sand under the bushes. I gathered from these birds, many of the beautiful red tail feathers.

The Gannet (*Sula cyanops*) lays its eggs in the bushes.

The Mutton bird digs a hole at the roots of the coarse bunch grass and forms for himself a very cosy nest there; this nest is difficult to find unless, as happened to me several times, one steps into the holes by mistake. The wingless birds which are about the size of a common sparrow, were plentiful here; these birds are the descendants of but three or four which the Walker Brothers of Honolulu, carried from Laysan Island on one of their recent visits.

I liberated here a dozen Laysan canaries which we brought with us. These were the gift of Captain Schlemmer to the Cable Company.

We left Midway Islands on Saturday evening, September 23rd, and after a smooth and pleasant trip, arrived at Honolulu on the 28th; thus ended for me a short but most interesting trip.

ENTOMOLOGICAL NOTES FROM THE DIVISION OF
ENTOMOLOGY OF THE BOARD OF AGRICULTURE AND FORESTRY.

REPORT ON A TRIP TO KONA, HAWAII.

Honolulu, T. H., November 29, 1905.

Mr. Alexander Craw, Superintendent of Entomology and Inspector of the Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Dear Sir:—In compliance with your commission of the 7th inst., wherein you direct me to proceed to the estate of Mr. E. H. Edwards, in Napoopoo, Hawaii, as early as possible and make a thorough examination into the origin, distribution, enemies, etc., of the "Green-bug" (*Coccus viridis*, Green) recently discovered upon portions of plants coming from said estate. Also to consult with growers regarding reported fungus disease upon vanilla plants in that district and render all possible assistance. I sailed for Napoopoo, Hawaii, on the noon of that very day, reaching my destination just 24 hours later. Early morning of the 14th inst. I returned from my mission, and beg leave herewith to submit my report upon it.

GREEN-BUG ON LEMON TREES AT HONAUNUA, S. KONA, HAWAII.

For reasons unknown to me, Mr. Edwards has lately gained the impression that all vegetation in Kona, including vanilla and coffee, the staples of that district, is suffering from what he surmised was a single cause. From hearsay information gathered from his neighbors and impressions of his own, he was led to believe that the lantana bug (*Teleonemia subfasciata*, Champ.), usually referred to by local entomologists as Tingid, is responsible for the trouble. In support of this theory he presented the evidence that this bug occurs occasionally upon all plants of the district and that the foliage is studded with specks which he presumed resulted from punctures produced by this insect. To determine this question definitely, Mr. Edwards submitted to this office a collection of affected leaves from every species of plant on his estate. These were received on the 24th ult. and carefully examined. Among them were a couple of leaves and a bit of twig labeled "Giant lime (mistaken for lemon) from Fiji," thickly

plastered with what we have definitely ascertained to be the above named scale insect. The author of this species reports it to have completed the destruction of the coffee industry in Ceylon in course of some 10-20 years. As but one or two of the numerous specimens received from Mr. Edwards showed signs of having been parasitized, and as Mr. Edwards' estate is located in the very midst of the coffee center on these Islands, and as, moreover, the insect is known to infest also rubber, guava and other plants, immediate action became imperative. Mr. Edwards wrote subsequently and also told me in person that three years ago this month he imported one half dozen plants from Fiji. While he did not observe scale upon the specimens when collected for us, he had probably observed it on previous occasions, but owing to the similarity of appearance between it and the immature stages of the guava cottony scale (*Pulveraria psidii*, Mask.), he did not suspect its identity. Mr. Edwards has other citrus plants growing upon his premises, and it is fortunate that he planted out these six lemon trees in a place considerably removed from the other plants, surrounded by vanilla vines, roots and other plants, and quite isolated. A careful examination of these plants revealed only two of the lot infested with the scale, the others being absolutely free from it. Near by was another lemon tree about twice the height of the Fiji specimens, with origin unknown, quite thickly infested with both the guava scale and green-bug. Quite a number of the mature scales were parasitized, the exit of one parasite having been observed and the insect captured. Some material for breeding of parasites and future reference was collected and securely put away safe from escape. The trees themselves, Mr. Edwards, at my suggestion, offered to up-root and burn. This was done before I left the district. The third infested tree above referred to proved quite a puzzle and worry for a while, as Mr. Edwards suspected it was presented to him by Mrs. Greenwell, in which case the insect might have been introduced into the Edwards' estate from the Greenwell's. With an eye to the elucidation of this possible evidence, Mrs. Greenwell was visited and questioned. This lady, while she remembered having presented Mr. Edwards with a peach tree, did not recall having given him a lemon tree, nor could any one of her children present recall the incident. They assured me, however, that had they given Mr. Edwards a citrus plant it would have been a seedling grown on their premises. I therefore examined practically every plant in their yard

and found no trace of the insect. With the same object in view, every kind of vegetation on Mr. Edwards' estate, as well as coffee and citrus trees on every place visited lining some 16 miles of Government road in Kona, were examined and no indication of the presence of the insect was detected. For the limited distribution of the insect I am inclined to account by the fact that there must have been but very few specimens of it imported with the plants. In addition thereto when the insect began to multiply the parasites working upon similar scales already established here took to this new host and kept it well in check. I believe that with the destruction of those plants we have eliminated a dangerous pest and may consider ourselves fortunate in having nipped the evil in the bud.

FUNGUS DISEASES OF VANILLA, COFFEE AND OTHER VEGETATION IN KONA.

Having solved the green-bug problem before me, I turned my attention to the explanation of Mr. Edwards' apprehensions as to the future of vegetation in Kona. Naturally he is most concerned about vanilla, and to explain the cause fully I will dwell somewhat on the history of the situation.

Some 15 years ago Mr. Edwards, who was then a vanilla grower on the Seychelles, had the misfortune of having his entire vanilla field devastated by a fungus disease described by Massee in the Kew Bulletin for 1892 as *Calospora vanillae*. Briefly this fungus was described as passing through three distinct stages in course of its life cycle the first of which, known as *Hainesia*, alone lives and propagates upon living vanilla leaves, while the subsequent two, known as *Cytispora* and *Calospora*, do so only upon dying and dead vanilla leaves. It is the spores of the last stage that germinate upon living leaves and produces the above *Hainesia* stage. It becomes evident from these facts that if all dead and decaying vanilla leaves be burnt the fungus would be deprived from a medium of propagation and thus be either entirely eliminated or at least reduced to insignificance. But by the time this discovery was made it seems to have been too late to save the vanilla field in the Seychelles. In a subsequent publication Massee reports to have identified this fungus upon vanilla also from Antigua and New Grenada. Some two years ago Mr. R. V. Woods, who is also an extensive vanilla grower of Kona, observed some brown discoloration within the

stems of his vines, from the effects of which a number of the vines were dying. Climatic and other conditions for vanilla growing in Kona seem so favorable that despite the presence of this stem disease, the vine continues to grow vigorously and rapidly until the disease breaks through the stem, when the entire plant succumbs. During a recent trip to London, Mr. Woods took some of the diseased stems over to Massee, who determined the trouble as identical with the one described from the Seychelles. The cuttings for all of the vanilla grown in Kona were originally imported here by Mr. Edwards from Fiji. Before starting vanilla in Kona, Mr. Edwards had spent some two or three months on the Fiji vanilla plantations, and according to his statement, has observed no disease existing there upon the vines. Had the Seychelles fungus been present there, he claims he should have recognized it without difficulty. He further claims that Massee's identification of the trouble prevailing in Mr. Wood's vines is wrong, as he is quite familiar with the manifestations of the Seychelles diseases, and does not recognize it upon the Kona vines. Mr. L. Lewton-Brain, a pathologist of the H. S. P. A. Experiment Station, who is familiar with vanilla diseases in the British West Indies, and who kindly examined some of the diseased Kona vines, supports Mr. Edwards in his conviction that the brown stain of the stem, while a fungus disease, is not identical with *C. vanillae*. The writer's familiarity with the natural appearance of vanilla vines and leaves is not sufficient authoritatively either to support or oppose Mr. Edwards' apprehensions concerning the prospects of vanilla in Kona, but is inclined to regard them rather exaggerated. Perhaps because of his unfortunate experience with fungus diseases upon coffee and vanilla in former years, and possibly also prejudiced by the alarmist reports of some of his neighbors and by occasional defective vanilla beans produced on his estate, Mr. Edwards has since his recent return from a visit to the coast been scrutinizing vegetation much more minutely than he probably ever did before. As a result of this scrutiny he naturally finds very few perfect leaves on any plant. Those of us who have kept an observant eye upon life in nature are aware that owing to the thousand and one vicissitudes through which every portion of a plant and animal has to go through before its mission is complete, very few of them pass the ordeal unscathed. No doubt some fungus or fungi are at work upon vanilla in Kona. Considering that vanilla has

been introduced into Hawaii from practically all the other parts of the world where it is grown and that no precaution against the introduction of its diseases has been taken, it would have been surprising if none had been brought in.

RELATION OF LANTANA INSECTS TO OTHER VEGETATION.

Owing to the onslaught of the lantana insects introduced by Mr. Koebele, this plant presents a very pitiable aspect indeed, especially after a protracted drought upon the leeward side of hills and islands. The Tingid above referred to has during the last year increased to such multitudes that beside occurring in large numbers upon each lantana leaf, is frequently observed, though in small numbers, upon vegetation in the vicinity, whither it is probably either blown by the wind or strays accidentally. Being so abundant the number of such accidental wanderings is naturally quite large. These accidents are probably as common to the lantana seed fly and the moth of the lantana leaf miner as they are with the Tingid, but the later is an insect that moves about deliberately and does not fly very readily, as do the other two, in consequence of which it remains longer under the observation of the layman. While the lantana seed fly undoubtedly occurs in vastly larger numbers than even the Tingid, yet the latter is much more frequently observed and is forming a stock in the layman's knowledge of insects. Under the circumstances it is natural that the Tingid should be regarded with suspicion by persons not otherwise informed. So far not one of the lantana insects introduced by Mr. Koebele has under my observation, or to my knowledge, under the observation of any of the other competent entomologists in Hawaii, been found to attack plants other than lantana. Even the Tingid, while it occurs quite freely on other plants, and in my belief will bear watching, has never been observed to injure other plants. At the same time there are many other causes that produce effects upon vegetation similar to those of the Tingid. I found in Kona, for example, a number of plants, particularly the leaves of the Ti root and Peon d'Inde, used as supports to the vanilla vines, badly infested with a species of red spider. Taro leaves were more or less infested with a species of Aphis or plant lice. Citrus plants had the usual retinue of scale insects with the purple scale (*Lepidecaspis beckii*) at the head of the list. The cottony guava scale (*Pulcanaria psidii*) locally occurs also in considerable numbers, and finally the ubiquitous

Siphanta or Torpedo-bug, (*Siphanta acuta*). This last, while much less numerous than I saw it there in June and certainly so than reported in August and September, was still present in excessive numbers upon every variety of plant. Aside from these insects there was ample evidence all around of injury by fungus diseases to a greater or lesser extent. Turning to vanilla, all portions of the plant, including leaves, vines and pods show quite a variety of mal-formation and discoloration. Particularly noticeable because of its abundance, was a peculiar specking upon the leaves, even those that have apparently evolved but the previous day. At first glance these specks would lead one to suspect as being the result of an insect puncture, yet no insect was observed in the act of producing one, although vines were examined both during the day and by lamp light at night. The specks are brownish in color and surrounded by a translucent ring, being concave in some instances and convex in others. As many as thirty of them were counted upon a single vanilla leaf. Hastily examined under the microscope, Dr. Cobb has found these specks usually located concentric with spiracles or breathing pores of leaves which he suggested would indicate injury by microbes. He could, however, make no definite statement as to the nature of the parasite. In no instance was this speck observed to extend its area and its affect upon the vine is not apparent. All the other apparent defects in the vanilla vines are evidently of a pathological or physiological nature, not attributable to insect work. Not being a specialist in fungus diseases my usefulness to vanilla ceased at this point. As Masee states in his paper in the "Kew Bulletin," there are probably a number of diseases affecting vanilla and nothing short of a study in the field by a plant pathologist will determine their nature and the effective remedies against them. On general principles I advised the vanilla growers of Kona, and this advice was sustained by Dr. Cobb and Mr. Lewton-Brain, to cut away and destroy all the affected portions of vines. To make cuttings by means of a tool, disinfected in a 10 per cent. solution of Formalin and to keep the vines covered with Bordeaux Mixture, the standard universal remedy against all fungus diseases. At my suggestion Mr. Woods has sprayed his vines with this mixture some six weeks previous to my visit, and despite the daily rains the mixture was quite evident upon the vines, both upper and under surfaces when I saw them. If this application be made every two or three weeks the vines will

remain completely covered by this coat of armor, proof against fungus onslaughts from without. After instructing the gentlemen in the principles involved in the preparation of this mixture, I left with them the chemicals (10 lbs. of blue stone and 10 lbs. of unslaked lime in a soldered tin) for the impending battle against the menacing fungi.

BROWN EYE-SPOT [*Cercospora coffeicola* (B. & C.)] AND OTHER
COFFEE DISEASES IN KONA.

The brown-eye spot disease seems to extend its ravages farther and farther afield. The coffee growers estimate their loss at about 25 per cent. of their present crop owing to this pest. If this disease is altogether responsible for this terrible loss, terrible because of the present low prices on coffee, and if, as elsewhere suggested, the prevalence of this disease is due to the presence of *Siphanta*, also known as Torpedo-bug, we hope that by the aid of the *Siphanta* egg parasite, this evil will be eliminated. Among the first colonies of this parasite to be sent out went to Kona, and while it was too soon when I was there to determine whether the insect is established, we are confident that it is, and hope for good results from its work.

A number of coffee trees, often in clumps, were observed dead. Whether in consequence of this or some other disease it is hard for an entomologist to tell, as insects are not responsible for their death. The Territory is sorely in need of a plant pathologist and physiologist to clear up many of the mysterious tree-growing failures.

I may mention in this connection that the planters of Kona sought my advice with reference to the advisability of petitioning the Secretary of Agriculture to detail a plant pathologist for temporary service in Hawaii until the diseases affecting principal crops here have been studied. It occurred to me as a very good idea, knowing that the United States Department of Agriculture occasionally does send out specialists to States or Territories in need of their advice and assistance. I merely suggested that such a petition be sent through and indorsed by the Board.

CITRUS TREES AND THEIR TROUBLES IN KONA.

Aside from the purple and other scales common on these plants in this Territory, many of the trees in Kona seem to suffer from

the fungous disease known as "die back." In course of this investigation it became clear to me that the people of this Territory are sorely in need of a pamphlet on the scale insects of citrus plants and the effective remedies against them. Such a bulletin should be given immediate consideration. So long as we have no effective enemies of such pests as the purple scale (*Lepidosaphes beckii*, Newn.) and the avocado pear scale (*Pseudococcus nipae*, Mask.) we are compelled to urge artificial remedies to check them.

HORN FLY PUPAE.

While in Kona I took the opportunity to show some of the ranchmen the appearance of the horn-fly pupa, in order that they may be able to send me material whenever I ask for it. One afternoon I took Mr. Henry Greenwell with me on a collecting expedition in their dairy paddock. Although the ranchmen complained bitterly of the horn-fly, we succeeded in finding only three pupae in course of a two hours' search.

MAUI BLIGHT OR LANTANA SCALE.

(*Orthesia insignis*, Dougl.)

On my way down to Kailua I observed this insect in several places upon lantana. This indicates that the ranchmen disregard entirely the warnings of the entomologists of this office against the distribution of this insect. So far it practically confines its attention to lantana, although on Maui it has been observed in injurious numbers on *Alternanthera*, *Colias*, and *Acharynthus*. How soon it will attack plants of economic value it is impossible to tell, but in view of the character of the insect the attack seems a certainty.

Respectfully,

JACOB KOTINSKY,
Assistant Entomologist.

NOTES ON DIVERSIFIED INDUSTRIES IN THE WEST INDIES.

BY MR. L. LEWTON-BRAIN,

Assistant Director, Division of Pathology of the Hawaiian Sugar Planters' Association Experiment Station.

The British colonies, usually designated as the West Indies, consist of British Guiana on the mainland of South America, Jamaica among the Great Antilles, and the colonies of the Windward Islands, Leeward Islands, Barbados and Trinidad among the Lesser Antilles. My own experience was confined to the islands of the Lesser Antilles; these form a chain, roughly speaking, stretching from north to south. Starting from the north the British islands are as follows: The Virgin Islands, St. Kitt's, Nevis, Antigua, Montserrat, Dominica (forming the Leeward Islands colony); St. Lucia, St. Vincent, the Grenadines, Grenada (the Windward Islands colony); Tobago and Trinidad. Barbados lies east of the chain, about 90 miles from St. Vincent. The islands stretch from about 18° to 10° N. and from about 60° to 64° W.

In 1897 the colonies were visited by the Royal Commission for the purpose of making an inquiry as to the causes of their then unprosperous condition.

As a result of one of the recommendations of the Commission, the Imperial Department of Agriculture for the West Indies was founded in 1898; its work has been, briefly, to develop the agricultural resources of the Windward and Leeward Islands and Barbados. The Department has no direct connection with British Guiana, Jamaica or Trinidad. Besides local officers in each of the islands, the Department maintains a staff of scientific men at the head office in Barbados. The present scientific staff consists of the Imperial Commissioner (Sir Daniel Morris, K. C. M. G., D. Sc., D. C. L., &c.), the Scientific Assistant (W. R. Buttenshaw, M. A., B. Sc.), the Entomologist (H. A. Bal-lou, B. Sc.), the Mycologist and Agricultural Lecturer (F. A. Stockdale, B. A.), and the Traveling Inspector in connection with Cotton Investigations (T. Thornton, A. R. C. S.).

In 1897 it was stated by Sir D. Morris, the colonies have been almost purely "sugar" colonies, and sugar, molasses, and rum might then be regarded as practically the only agricultural pro-

duction of British Guiana, St. Vincent, Barbados, Antigua, and St. Kitt's-Nevis. In addition to aiding the sugar industry by the introduction and raising of new varieties of cane, suggesting lines of treatment for the various cane diseases, conducting fertilizer experiments, etc., the Imperial Department has encouraged the development of the existing subsidiary industries, and the introduction of others. It is pretty safe to say that none of the industries mentioned in the following notes would be in such a flourishing condition to-day had it not been for the work of the Imperial Department of Agriculture.

FRUIT.

The fruit trade of Jamaica has long been an important one. During the year 1903-4 over \$2,500,000 worth of bananas and over \$400,000 of citrus fruits were exported, and this in spite of the hurricane of August, 1903, which ruined thousands of acres of banana cultivation. The export for the previous year was over \$5,000,000 worth of bananas and over \$500,000 of citrus fruits.

One of the most interesting developments of the last few years in the Lesser Antilles, fostered by the Imperial Department of Agriculture, has been the growth of the banana industry of Barbados. An account of the industry appeared in the *Journal of the Society of Arts*, in November, 1904; from this account, which gave a fairly complete statement of the progress of the shipments, the following notes are abridged:

"In 1902, a few bunches of bananas were sent to England as an experiment; these were found, on arrival, to be of splendid quality and flavor, but in bad condition owing to faulty packing and handling. After some experimenting, this trouble was overcome, and small consignments were sent which arrived in perfect condition. The consignments were then considerably increased, but the results were still unsatisfactory, for although it was comparatively easy to bring a few crates, the case was quite different when a large number were shipped at one time; the temperature of the holds of the steamers became very high owing to the generation of heat by the ripening fruit. For this reason, several consignments arrived with 90% of the fruit rotten. However, the shipments were continued, and eventually, by the instalment of a proper system of ventilation on board the Royal Mail steamers, complete success has been attained, so that the fruit now received

in bad condition does not exceed 1%, and that is usually the result of inexperience in shipping.

"From the first, no attempt has been made to compete with the Jamaica banana industry, the fruit grown in Barbados being a different kind from that shipped from Jamaica, which is a large-fruited variety known as the 'Gros Michel.' The latter grow on plants 14 to 15 feet high, and is capable of being roughly handled without any appreciable damage. The Barbados banana is the same variety as that grown in the Canary Islands and Madeira, and is known as the 'dwarf' or 'Chinese' variety. Its height does not exceed 10 or 12 feet, but the bunches are, as a rule, large and heavy, and the fruit of good size; the flavor is decidedly superior to the fruit from the Canary Islands or Madeira, which is probably due to the richer nature of the Barbados soil.

"In about eleven months from the time of planting, the bunch is ready to cut, but the exact time to do this can only be known from long experience, and this lack of experience is the usual cause of failure in starting.

"The Jamaica banana can be shipped naked and arrives in England in good condition; but the Barbados fruit being much more delicate, has to be packed, as it is quite impossible to ship it otherwise. On being cut, it is sometimes packed in the field, and sometimes sent to a packing house, but wherever it is packed, it is handled with the greatest care, as a slight bruise when the fruits are still green (in which condition the bunch is, of course, always shipped) would when ripe show a black mark, which would considerably reduce its value in the English market. So great is the care taken to avoid this that the Barbados fruit arrives in England in better condition than any other kind, many of the bunches being absolutely free from marks.

"The bunch is first wrapped in a sheet of cotton wool, which preserves it from injury and absorbs moisture; it is next wrapped in a sheet of thin paper to keep the cotton wool in place. It is then placed in a crate in which a layer of dead banana leaves or 'trash,' as they are called, has been placed. The bunch is then carefully packed around with more 'trash,' and the top of the crate nailed on. The crate is then marked with a certain number of crosses to denote the size of the bunch it contains, and with the distinguishing mark of the shipper.

"The consignments have, up to the present, been made by Mr.

J. R. Bovell, Agricultural Superintendent in Barbados, and each grower or shipper has his own mark or number, a necessary arrangement to avoid confusion. All the fruit shipped by Mr. Bovell is consigned to one firm having extensive stores at Plymouth and Portsmouth.

"As an example of the care taken in shipping, it may be mentioned that the temperature of the ship's hold is examined every six hours during the voyage, and regulated as is necessary."

It should be mentioned that Barbados is the last port of call of the Royal Mail steamers, leaving the West Indies for England. The voyage is one of twelve days, and a boat leaves every fortnight.

The following figures are interesting as showing the rapid growth of this "minor industry." In 1902, 18 bunches were shipped; in 1903 the number was 6,691; in 1904, 15,326. In 1905, up to Oct. 5, 28,018 bunches had been shipped, while the last shipment for which I have figures consisted of 2,700 bunches.

A new fruit company, the British West Indian Fruit Company, Limited, has recently been started in Trinidad. Operations have already begun, and it is expected that very soon that colony will be exporting bananas on a large scale. The fruit will be shipped naked and so will not compete with that from Barbados.

Oranges, of course, grow commonly in all the islands and have formed an article of export for years. For the most part, no attention has been paid to the varieties grown and most of the trees were self-sown. Little, if any, attention also has been paid to the picking, grading and packing of the fruit for export, so that it is not surprising that the prices realized, and the reputation of West Indian oranges, were not high. Of late a good deal has been done to remedy this state of affairs, especially in Dominica. Considerable plantings have been, and are being, made of the best varieties—Washington Navel, Jaffa, etc., while a local company, the Atlantis Fruit Co., is doing good work in the scientific grading, packing, and exporting the best of the oranges now produced in the island. The climatic conditions, soil and configuration of Dominica seem peculiarly favorable for the production of oranges and other citrus fruits. As showing the growing demand in that island for plants of the best varieties, it is interesting to note that, during the year ended March 31, 1905, 1,774 budded orange plants were distributed from the Botanic Station there, while for the current year over 4,000 such

plants had been ordered; that is as many as can be raised at the station, so that it has become necessary for planters to establish nurseries of their own.

Antigua has had for some years a small pineapple industry, but, owing to fungoid disease and other causes, it is not at present in a very flourishing condition. Montserrat also produces pines which are exported to the other islands. Of late years the cultivation has been extended in St. Lucia, and last year some shipments were made to England from that island. One of the chief difficulties is that of transport. So far as I know no attempt has been made to can any of the fruit. The favorite variety is known as the "Black Antigua"; this is not a showy fruit, but the flavor is excellent. "Smooth Cayenne" and other varieties, more suitable for table purposes, for which a handsome pine is preferable, are being tried.

LIMES (*Citrus medica* var. *acida*).

The cultivation of limes has been an established industry in Montserrat for nearly 30 years; this is now one of the principal industries in that island and the most important in Dominica. The lime requires a moist climate, and a sheltered situation to give the best results. The limes are gathered as they fall from the trees, carried to the mill where the juice is expressed and this is shipped either raw or concentrated. Besides the juice an essential oil is prepared from the rind, either by distilling the skimmings of the raw juice, or by slightly bruising the rind of fresh fruits, the latter product being superior. Fresh green limes and limes pickled in brine are also exported.

In 1883, the total value of the lime exports of Dominica amounted to about \$24,000, in 1896 they had increased in value to about \$95,000; the following table shows the comparative values of the various products in 1896 and 1904:

	1896.	1904.
1. Raw lime juice.....	\$17,000	\$34,000
2. Concentrated lime juice.....	50,000	90,000
3. Essential oils	16,000	5,500
4. Fresh limes	3,500	14,000
5. Pickled limes	2,800	1,600

That considerable new plantings are being made is shown by the fact that during the past year 21,757 lime plants were distributed from the Dominica Botanic Station, and 7,868 from the station in Montserrat.

An important advance has been made in Dominica by the production of a spineless lime; 1,672 plants of this variety were distributed last year in Dominica, in addition to the 21,757 already mentioned. The demand for plants of this variety greatly exceeds the number that can be supplied. A seedless variety has been reported recently from Trinidad.

CACAO.

In Trinidad, cacao cultivation has been established from very early days, and the island is probably better known for its cacao than for its sugar. In 1879 the area devoted to this cultivation was over 24,000 acres. In Grenada also cacao, which was at first planted only on mountain lands, was afterwards found to thrive even better in the lower lands, and practically entirely replaced sugar, which now is only cultivated on one or two estates. These are the chief cacao-producing islands in the West Indies, and it is curious to note how the cultivation differs in the two cases. In Trinidad, all the cacao is grown under shade, the most common tree used for this purpose being the "Bois Immortelle" (*Erythrina velutina* and *E. umbrosa*); very little, if any, cultivation is given the trees. Planters are unanimously of opinion that cacao cannot be grown without permanent shade. In the neighboring island of Grenada, however, after the first few years (during which temporary shade is supplied by bananas or plantains) no shade at all is given the land is, on the other hand, well cultivated and the trees are always necessary, if the lands are to be productive. The yield per acre is considerably higher in Grenada than in Trinidad. The following is a list of the principal cacao-producing islands in the West Indies, and the output from each in 1900, as given in the *Agricultural Yearbook of the British Empire*, 1901, p. 100.

The following table shows the output from the principal cacao-producing islands in the West Indies, as given in the *Agricultural Yearbook of the British Empire*, 1901, p. 100. The output from Grenada in 1900 was 337,431 cwt. The output from Trinidad in 1900 was 1,100,000 cwt. The output from the other islands is given in the following table.

place in the list of exports. Thus, the value of the cacao annually exported from Trinidad now exceeds \$5,000,000, while from Grenada \$1,250,000 worth is exported. Though Trinidad and Grenada are the two most important producers of cacao in the West Indies, there is a constantly increasing export from Jamaica, which reached the value of \$420,000 in 1901-2, while in 1900 the exports of cacao from St. Lucia formed 17% of the total exports of the island. Considerable quantities of cacao are also shipped from Dominica, St. Vincent and British Guiana, while Montserrat and St. Kitt's-Nevis also produce small quantities. [Nevis now has 20 acres under cacao cultivation.]

"With regard to the quality of the cacao shipped from the West Indies, that from Trinidad fetches the highest price, the bean being said to be 'the finest and best flavored.' The London prices vary from 65s. to 80s. per cwt. Grenada cacao, although it does not obtain quite as high a price, has a good and regular flavor and the crop is 'eagerly bought up in British and American markets.'

"Of all cacao-producing islands in the West Indies, St. Vincent is the only one unable to show a decided advance. This, of course, is due to the hurricane of 1898. In 1897 the exports of cacao were of the value of \$22,000; two years later they were worth only \$500. This important industry has to some extent been resuscitated, and in 1902, 780 cwt., of the value of \$7,500, were exported. [In 1903-4, the export amounted to over 1,000 cwt.]

"The output of cacao from these islands has, then, considerably increased during the last few years. Further, there are many indications that, in the ordinary course of events, this increase will be maintained. The planting of cacao has received much encouragement from the Imperial Department of Agriculture, and in all the islands mentioned there are evidences that the acreage under cacao has been considerably extended. The best evidence that much attention has been given to the planting of cacao is to be found in the large distribution of cacao plants from the various botanical establishments in the West Indies. It will be seen that these institutions have been no small factor in the extension of the cacao industry. From four of the Botanic Stations nearly 30,000 cacao plants, in addition to over 17,000 seeds, were distributed

in the year 1903-4. In Jamaica, during the last four or five years, the number of cacao plants distributed from Hope Gardens has been nearly 50,000 per annum."

The industry is still growing; from Grenada during 1904, 117,791 cwt. of the value of over \$1,300,000 was exported; St. Vincent, during the same year, increased the export of cacao from \$7,500 to over \$10,000 worth, while Dominica during 1904 shipped more than \$100,000 worth of this product. St. Lucia in 1902 exported over 13,000 cwt.

These exports will be largely increased when the large area that have been planted during the last few years come into bearing.

From the Dominica Botanic Station, during the last year, 11,834 cacao plants were distributed, in addition to more than 1,000 pods; from the St. Vincent Station, 22,204 plants were distributed during the same year. In islands where the industry has been longer established, of course, the plantations are able to raise their own seedlings for necessary supplying and for extending their areas. So the Botanic Station figures represent only absolutely new plantings.

RUBBER.

Rubber cultivation in the West Indies is, for the most part, still in the experimental stage. The most extensive plantings have been made in the small island of Tobago, where there are some 90,000 *Castilloa* trees, the oldest (100 to 150 trees) being about fourteen years old. Practically all the rubber trees in Tobago are the Central American *Castilloa elastica*, which thrives well from sea-level up to 900 feet. Experimental tapings have been made, and the results indicate that " $\frac{3}{4}$ to 1 pound of rubber may be safely reckoned on as the average yield of a tree thirteen to fourteen years old." The trees are put in at 12 feet by 12 feet and are intended to stand permanently at 24 by 24 feet. The intermediate trees are to be tapped in their seventh, eighth and ninth years, and then cut down.

Rubber is also being planted in some of the other islands, especially in Dominica; the Botanic Station there has distributed the following quantities of rubber plants and seed during the last few years:

1902-3, 1,215 *Funtumia* plants, quantities of *Funtumia* seed, and 32 pounds of *Castilloa* seed.

1903-4, 4,316 *Funtumia* plants, 2,840 *Castilloa* plants, 38 pounds of *Castilloa* seed, and quantities of *Funtumia* seed.

1904-5, 4,004 *Funtumia* plants, 2,645 *Castilloa* plants, 21 pounds *Castilloa* seed, and quantities of *Funtumia* seed.

Smaller quantities have also been distributed in St. Lucia, Montserrat and St. Kitt's.

COTTON.

Limes, rubber, cacao, and similar cultivations flourish well in the more mountainous islands of the West Indies, with their abundant rainfall, sheltered valleys and deep rich soil. But none of them were suited to the conditions of the sugar lands of Barbados, Antigua, St. Kitt's, and Nevis; these islands, therefore, remained, until recently, without a crop which could be substituted for, or alternated with, sugar-cane. Considerable areas of land in St. Vincent and Montserrat were also without a profitable cultivation.

Cotton was found growing in the West Indies when these islands were first discovered by Columbus. Later on, 70% of the raw cotton imported into England came from the West Indies. With the increase of cotton culture in the Southern States and the high prices then obtaining for sugar, the West Indian cotton industry died out. It was revived to a certain extent at the time of the Civil War, but only temporarily, and up to 1900 the only cotton exported from the West Indies was that from the small island of Carricacou, a dependency of Grenada. Here a local variety, with short-staple, known as "Marie Galante," was cultivated by the peasantry, together with corn and pigeon peas.

The first of the recent experiments in cotton growing in the West Indies was started in St. Lucia in 1900. During the next year the experiments were extended to Barbados and to some of the other islands. In these early experiments, trials were made of various varieties, including several kinds of Upland cotton, Egyptian, Peruvian, Sea Island, and a number of local semi-wild varieties. It was soon evident that the Sea Island cotton was by far the best suited to local conditions.

Sea Island cotton (*Gossypium barbadense*) was a native of the West Indies, introduced, acclimatized and greatly im-

proved in the Sea Islands of South Carolina. It is a long-stapled cotton, which fetches a far higher price than the ordinary short-stapled Upland cottons. This cotton will only thrive when grown within a short distance of the sea, so that the area that could be devoted to its cultivation is distinctly limited; Upland cotton cultivation, on the contrary, is capable of almost unlimited extension. As Sea Island cotton was found to thrive admirably in the West India Islands, it was obvious that the best policy was to specialize with this variety, in spite of the greater care necessary in its cultivation and the smaller yield of lint per acre.

In 1902 the total area planted in all the islands was 500 acres; in 1903 this was increased to 4,000 acres; in 1904 the area planted in Sea Island cotton was nearly 8,000 acres. The seed for these plantings was imported by the Imperial Department of Agriculture from the Sea Islands of S. Carolina; but in 1905, owing to the success of the West Indian cotton in the English market, the planters of the Sea Islands refused to export any more seed, so that this year the West Indies have to depend upon the seed raised there; as West Indian cotton has been fetching a higher price this year than that from the Sea Islands themselves, there is little fear that this will prove a serious blow to the new industry.

The following figures, showing the amount of Sea Island cotton shipped from the West Indian Colonies, for the period from January 1 to September 30, 1905, are taken from the *Agricultural News* of November 11:

Colony	Weight in pounds	Estimated value
Barbados	274,998	\$ 68,750
Nevis	144,721	36,180
St. Vincent	97,152	24,280
St. Kitt's	76,899	19,225
Montserrat*	70,723	17,430
Grenada (Marie galante)	212,722	13,465
Antigua	52,656	13,160
Jamaica	44,608	9,650
Anguilla	30,977	7,750
Trinidad	12,981	1,930
Virgin Islands*	3,600	600

British Guiana	1,258	180
St. Lucia*	988	125
Total	1,024,283	\$ 212,730

* Up to June 30.

This return does not take into consideration the value of the cotton seed itself, which would amount to about 2,500,000 pounds. At 1¼c. per pound, the price at which it is sold in Barbados for stock feed, the value of this would be over \$30,000.

Cotton, being an annual crop, can be grown easily as a rotation crop with sugar, hence its great suitability in the primarily sugar-producing islands, as Barbados, Antigua, St. Kitt's and Nevis. In St. Kitt's, cotton is actually planted as a catch crop, between two crops of cane.

This new industry practically owes its existence to the Imperial Department of Agriculture. The department carried out the first preliminary experiments which showed that cotton could be made a paying crop in the West Indies; other experiments to determine the best varieties for planting, the best time for planting, the most suitable localities in each island, etc., were all undertaken by the department, in some cases with the co-operation of the planters, in others on its own experiment plots. The department imported the best obtainable seed from the Sea Islands, disinfected it, and sold it at cost price to planters. Sir Daniel Morris and Mr. J. R. Bovell visited the Sea Island cotton region of the States, and made a special study of the methods of cultivation and manufacture in vogue there; the results of their observations were published in the *West Indian Bulletin*, and the knowledge thus gained was of great value to those embarking on a strange culture. Officers of the department made a special study of the insect and fungoid pests, which inevitably follow the extensive planting of a new crop, and were able to devise lines of treatment.

The British Cotton-growing Association rendered valuable assistance in making grants of money and machinery; also in taking charge of the shipments and finding the best market for them. In 1904, the Association arranged for a visit to the West Indies of Mr. E. Lomas Oliver, who rendered great service by explaining in detail the requirements of spinners with regard to uniformity of staple, color, fineness, etc.

OTHER INDUSTRIES.

A large number of other minor industries are carried on in the West Indies, some old-established ones, others of recent introduction. In nearly all cases these industries are now receiving more attention and are being carried on in a more scientific manner.

The arrowroot industry was and still is an important one in St. Vincent. In 1892 the value of the arrowroot exported was over \$300,000, in 1896 the value had declined to \$100,000. The price obtained for the St. Vincent product is very low, being only about from 3 to 7 cents per pound, while that from Bermuda fetches from 30 to 40 cents. Of late an attempt has been made, by paying more attention to the preparation and by putting up the product in a more attractive manner, to secure a higher price for the St. Vincent arrowroot.

Cocoa-nuts grow, of course, in all the West Indian Islands, but the industry is of greater importance in Jamaica and Trinidad than elsewhere. In Trinidad it was estimated in 1902 that the local consumption of oil amounted to something like 700,000 gallons, representing thirty-five to forty millions of nuts. In the same year the exports of copra were 414 tons (about two and three-fourths millions of nuts); the oil exported (16,000 gallons) represented another million nuts. Altogether, with the exports of nuts, the produce amounted to about fifty millions of nuts, while the area under this cultivation was returned at 14,000 acres.

Rice is cultivated mostly in Trinidad and British Guiana, and chiefly by the East Indian immigrants. In 1904 the yield of paddy rice in British Guiana was equal to nearly 13,000 tons of clean rice. In this colony there is a large rice factory in Georgetown besides a number of smaller factories in other

cent introduction
 first two islands
 sugar estates, the
 Montserrat
 sant proprietors;
 topped against 190
 colonies, and
 that there is a

ready market in New York for the surplus crop, provided that the onions are properly graded and packed. The reason for this is that the onions from these islands can be placed in the New York market at least a month ahead of those from Bermuda. Seed is imported by the Imperial Department of Agriculture from Teneriffe and distributed to growers. In 1904, 767 pounds of seed, sufficient to plant 200 acres in onions, was thus imported.

Bee-keeping is a minor industry of some importance in Jamaica, about \$50,000 worth of honey, and \$30,000 of wax being exported from that island annually. St. Lucia has a small, but growing bee-keeping industry. The number of colonies in the latter island has increased from 70 in 1902 to 400 in 1905; in 1904 four tons of honey were exported, in addition to that consumed locally.

Stock-raising is another industry that has received attention from the Imperial Department of Agriculture; thoroughbred horses, donkeys, cattle, goats, pigs and poultry have been imported with a view to improving the local breeds, and their services have been extensively utilized.

Tobacco cultivation is carried on with great success in Jamaica, the Jamaica cigars, as I know from experience, being excellent. The industry is largely in the hands of Cubans, who have settled there. Tobacco, for local consumption, is also grown in Barbados, Antigua, and St. Kitt's. Jamaica also has a growing cassava starch industry.

GOAT KEEPING.

Water for goats is a most important matter, but often neglected. A cow will quench her thirst at any filthy pool or pond, but not so with goats. They are most fastidious. Clean, fresh water should always be offered twice daily, and oftener during very hot weather; but clean it must be. If a goat drinks well it invariably milks well. Salt is another important matter. It is equally as necessary to goats as it is to us with our food, and moreover it incites thirst, which means that more water will be drunk. There is no animal more wasteful in feeding; once they have soiled food in any way they will not afterwards touch it. Grass should therefore always be given in a rack.—*Journal of the Jamaica Agricultural Society.*

MEETING OF THE FARMERS' INSTITUTE.

The regular meeting of the Farmers' Institute of Hawaii took place in the Library of the Bureau of Agriculture and Forestry, Honolulu, on Dec. 2nd, 1905, Mr. Jared G. Smith, presiding.

Mr. A. Louisson, who intended to read a paper on "The Coffee Industry of Hawaii," was unfortunately unable to be present.

The first lecture of the evening was presented by Mr. F. G. Krauss, entitled "The Balanced Ration and Stock Feeding." In the discussion which followed, in referring to the algaroba bean, Mr. Krauss said: "It is practically impossible to grind the beans as they are. The manufacturers claim that the vanilla bean grinds more easily than the algaroba, and the vanilla is one of the most difficult to grind. It is reported that the mill which grinds the vanilla easily, becomes immediately clogged by the algaroba." In answer to a query as to whether the beans could not be crushed as barley, Mr. Krauss said: "We have tried that method also, but find that the beans stick to the wheels of the mill. Some millers have been experimenting on a practical method of treating the beans for two years with beans supplied by us, and have sent us the result of their work. The beans return in all forms, sometimes looking like alfalfa. As regards steaming, which appealed to me for a long time, although we began feeding carefully, we found that within a few days it became distasteful to the stock. We have found that if the beans are well dried before steaming, by exposure to the hot sun, they will keep from six to eight months.

Mr. Smith, in answer to a question as to the best way of planting algaroba trees on waste lands, said: "You can get the best results by soaking the seed, as in the case of the Black Wattle. The seed should be soaked in boiling water, which is not kept boiling, and then planted while wet. At the Experiment Station we have been growing algaroba growing at an elevation of 1000 feet.

The second lecture of the evening, by Mr. J. G. Smith, was on "The Algaroba Bean," and appeared in our issue of Dec. 1st, 1905.

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in such condition that the forests will return naturally. Where reservations are made, trees should be planted in a continued track. But forest planting on a large scale is necessarily an expensive operation, and as far as possible, we will depend on the restarting of the forest through natural means. As to the question of forest planting, I believe there is much which could be done in planting coniferous trees from the temperate zones in the higher elevations of Hawaii and Maui on Mts. Haleakala and Mauna Loa, on an elevation of from six to nine thousand feet, where cattle seldom go. Meantime, we are experimenting on some of the trees set out on the higher ranges, where we are trying to grow trees which we can depend on later when we come to the actual work.

The President then asked Mr. W. W. Hall if he could give some information regarding rubber. Mr. Hall replied, in substance, as follows: "Rubber growing is an industry which has only been started since last winter in Hawaii. We have imported 75,000 seeds and we have growing in Maui about 26,000 trees, which are growing rapidly and with those which will be planted in a few months, we hope to have 50,000 trees by the end of January. These are of two varieties, perhaps 26,000 of the Ceara variety, which was the first to be planted here and grows more rapidly than other varieties. We have a large number of the true Hevea, probably the finest rubber tree in the world, but our trees are very young. I visited Nahiku two years ago and it rained all the time I was there, and it is so rainy that it is hard to plant trees. We received twelve Wardian cases of stump from Ceylon lately, and also 25,000 seeds of Hevea, which grew rapidly.

During the week of Arbor day we planted 12,000 trees. These will become large forest trees, and I would advise some of the plantations which have suitable land, to plant such trees. They will not only produce handsome trees, but can be tapped in a few years."

The President: "Do you cultivate the young trees?"

Mr. Hall: "No, we clear the land of bushes and lantana and dig holes five feet round and plant in the center. The ground is very loose and one can take a stick and run it round the tree. We have some Ceara trees we planted last February and they are already twelve or fourteen feet high and have pods on them."

In answer to a question as to whether taking the rubber finally

killed the tree, Mr. Hall said: "I know many trees have been tapped to death, so that the price of rubber is going up."

The last paper of the evening was presented by Mr. J. G. Smith, entitled, "Agriculture in Hawaii," which appears in this number.

At the conclusion of Mr. Smith's address, Judge Dole expressed his appreciation of the paper and said: "I think it is very valuable and ought to be printed so as to be widely read on the Islands. I would like to suggest that."

After a short discussion relating to corn growing on the Islands, the meeting adjourned.

DR. N. A. COBB.

One of the first appointments made under the Department of Agriculture of New South Wales when it was created, 15 years ago, was that of Dr. N. A. Cobb. During that time, when he occupied the position of Government Vegetable Pathologist, the investigation of many problems affecting those diseases of plants and of farm stock of parasitic nature were taken in hand by Dr. Cobb with results, which when calculated in money value must be considerable. The news of Dr. Cobb's appointment to the position of Director of the Division of Pathology and Physiology in connection with the experiment station of the Hawaiian Sugar Planters' Association, Honolulu, while reflecting great credit on Dr. Cobb himself, will prove a loss both to Australia as a whole and the individual settler in particular. On all occasions when advice was needed on questions of plant diseases, our own department has been glad to have Dr. Cobb ready to assist, and his severance with the Government of New South Wales in Sydney will prove a serious loss to the Department. In the next issue a review of the "Diseases of Plants," by Dr. Cobb, will be published. The Department of Agriculture, Sydney, will

THE BANANA INDUSTRY OF COSTA RICA.

Our Consul at Port Limon, Costa Rica, has published a review on the banana industry of Costa Rica during the past twenty-five years.

The banana industry of Costa Rica has risen to such proportions that the banana exports from that country now exceed in value the coffee crop. At the end of 1904, fifty thousand acres of land in Costa Rica were planted to bananas. The United Fruit Company, an American corporation, own fifty per cent. of the banana lands, and control seventy-five per cent. of the product.

Previous to 1902, the whole crop was sold in the United States, since that time considerable shipments have been made to Great Britain, and an effort is being made to extend the banana trade to other European countries. While shipments from Point Limon amounted to 2,804,000 bunches in 1900, the number exported in 1904 had risen to 5,760,000 bunches, and it is estimated that the production will be double this in another five years.

Well drained, sandy, calcareous soils are considered ideal for the banana. The Consul states that the banana plantations pay about 40 per cent. per annum on the investment. The cost of a 100-acre plantation is given as follows:

	Pesos
Cost of land at 20 pesos per acre.....	2,000
Preparation and clearing, 50 pesos per acre.....	5,000
Cost of cultivation of 180 plants per acre, to time of bearing, 31 centavos per plant.....	5,580

Against this, cost of harvesting, marketing and supervision, amount to 2,640 pesos, leaving a net return of 2,940 pesos per year from 100 acres.

Under the most favorable circumstances, a plant will produce a bunch of bananas in nine months after planting, but the average time required is from 15 to 18 months. The life of the plant is indefinite, depending upon soil and other conditions. Some plantations replant every 6 or 7 years. Others, which are fifteen years old, give as good results today, as when two or three years old, at which stage the plants are at their best. Large plantations have portable track for gathering the crop for market. The outlay for buildings and tools

is small. Yellow fever is prevalent in Costa Rica, so that the labor supply is limited to the Jamaica negroes, who are immune to this disease.

JARED G. SMITH.

OFFICIAL REGULATIONS REGARDING LIVE STOCK.

Dr. Victor A. Norgaard, Territorial Veterinarian, has issued the following three official circulars regarding live stock in Hawaii:

RULE 1.—INSPECTION OF IMPORTED LIVE STOCK.

In order to prevent the introduction into this Territory of infectious, contagious and communicable diseases among live stock and other animals, local managers or agents of Steamship and Navigation lines or the commanding officer of any ship shall notify the Territorial Veterinarian or the local Live Stock Inspector immediately upon the arrival of any ship, of the presence on board, if any, of live domestic animals, including poultry and dogs, when same is intended to be landed in this Territory, and shall upon arrival of any ship furnish the inspecting officer with a list of the number and kind of animals taken on board from any port outside of this Territory, the number and kind destined for the Territory, the names of the owners or consignees, and a report as to the condition of health and cases of sickness or death among the animals while on board.

If necessary to remove such animals before the arrival of the inspector they must be confined on the pier in such a manner as to facilitate inspection, but should in no case be turned loose on the pier. Hogs and sheep shall be confined in temporary pens. Cattle and horses shall be tied on the pier. No animal of any description shall be allowed to leave the pier until the Territorial Veterinarian or local Live Stock Inspector has issued a certificate of health permitting the landing of the animal or animals in question.

In no case shall the removal of live animals from the ship for inspection or other purposes, constitute a landing until a certificate of health for such animals has been issued.

Until further notice the ports of Honolulu, Oahu, and Hilo, Hawaii, shall constitute the only ports of entry for live stock and other animals for this Territory.

Any violation of this regulation is a misdemeanor.

This regulation shall take effect at once.

C. S. HOLLOWAY,

Executive Officer, Board of Agriculture and Forestry.

Approved September 11, 1905.

G. R. CARTER,
Governor.

FILE 2.—INSPECTION AND TESTING OF IMPORTED LIVE STOCK FOR GLANDERS AND TUBERCULOSIS.

In order to prevent the further introduction of glanders andarcy into this Territory, it is hereby ordered that:

No horse stock, (including mules and asses), shall be admitted to the Territory unless accompanied by a certificate of health showing that the animal or animals in question have been submitted to the mallein test and found to be free from glanders. Said test must be made and certificate issued by a competent veterinarian whose name appears upon the list of graduates from a recognized veterinary college and whose professional standing is satisfactory to this Board. The test must be made according to the rules of the Territorial Veterinarian and recorded on blanks furnished by him for this purpose.

If such animals shall not have been tested before shipment they shall upon arrival in this Territory be placed in quarantine and held there until mallein tested under the supervision of the Territorial Veterinarian or the local Live Stock Inspector and at the expense of the owner.

Any person contemplating the importation of horse stock to this Territory shall notify the Territorial Veterinarian or the local Live Stock Inspector and obtain from him the necessary blanks and instructions.

In order to prevent the further introduction of tuberculosis in cattle it is hereby ordered, that:

No cattle above the age of six months shall be admitted to the Territory unless accompanied by a certificate of health showing that the animal or animals have been submitted to the tuberculin test and found to be free from tuberculosis. The said test must be made under the same condition as those governing the importation of horse stock and be recorded on blanks furnished by the Territorial Veterinarian. If unaccompanied by such certificate the animals shall be tested upon arrival in the same manner as prescribed for horse stock.

If any horse stock shall be found by the Territorial Veterinarian or the local Live Stock Inspector, upon arrival in the Territory, to be infected with glanders or any cattle to be infected with tuberculosis, the same shall be immediately destroyed and the carcass disposed of at the expense of the owner, under the supervision of the Territorial Veterinarian or the local Live Stock Inspector..

Any violation of this regulation is a misdemeanor.

This regulation shall take effect at once.

C. S. HOLLOWAY,

Excutive Officer, Board of Agriculture and Forestry.

Approved September 11, 1905.

G. R. CARTER,

Governor.

RULES 3.—CONCERNING GLANDERED HORSE STOCK IN THE TERRITORY.

It having been brought to the notice of this Board that a contagious disease known as glanders and farcy prevails among the horse stock in various portions of this Territory; therefore, in case any animal shows symptoms of glanders, the owner or person having charge of the same, or any person having reason to believe or to suspect that an animal has glanders shall immediately notify the Territorial Veterinarian or the local Live Stock Inspector.

If the Territorial Veterinarian or the local Live Stock Inspector decides that there is reason to believe an animal is suffering from glanders he shall at once isolate the suspected animal or animals and either submit them to the mallein test or remove them to quarantine, where they shall be kept under observation until the nature of the disease can be definitely established.

All animals which upon examination by the Territorial Veterinarian or the local Live Stock Inspector are found to exhibit definite symptoms of glanders shall be destroyed and the carcass disposed of under the supervision of one of the above mentioned officers.

All other animals which have been exposed to the infection by being in the same stall, yard or premises, or which in any way have come in contact with an affected animal, shall be quarantined for such period as shall be required by the Territorial Veterinarian or the local Live Stock Inspector, or submitted to the mallein test.

The premises where affected animals have been kept shall be disinfected under the supervision of the Territorial Veterinarian or the local Live Stock Inspector.

All expenses in connection with the examination, testing, destroying and disposing of affected animals, as well as quarantine and disinfection shall be paid by the owner.

Any violation of this regulation is a misdemeanor.

Witness my hand and seal at Washington

W. H. HOLLOWAY,

Secretary of the Department of Agriculture and Forestry.

Attest my hand and seal at Washington

W. H. CARTER,

Governor.

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Board of Commissioners of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEED- LINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Ironwood, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poincians, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2 1-2 cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.





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